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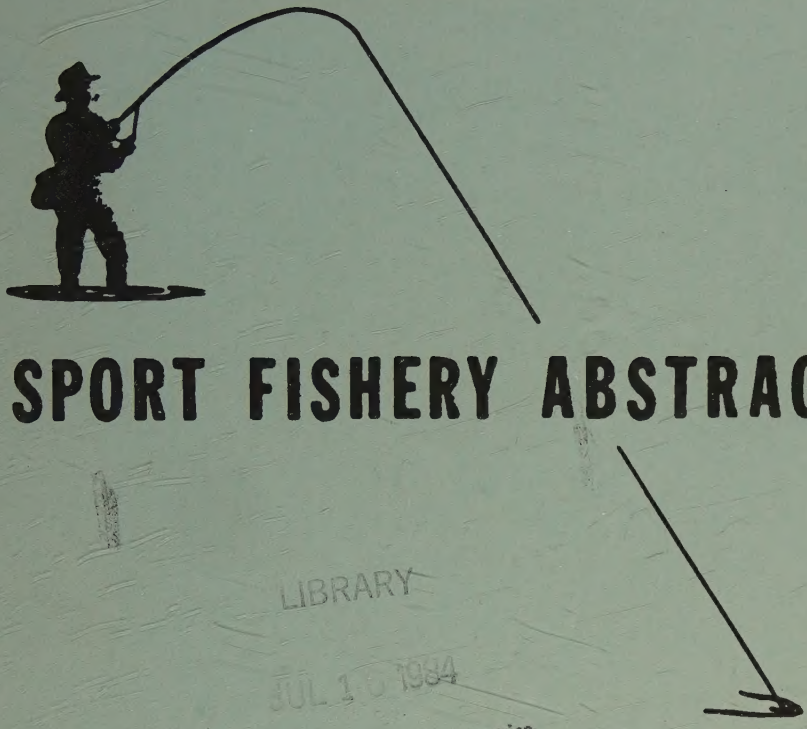

SPORT FISHERY ABSTRACTS

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SPORT FISHERY ABSTRACTS

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Sport Fishery Abstracts is intended to furnish fishery biologists with abstracts of current literature in sport fishery research and management.

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SPORT FISHERY ABSTRACTS

An abstracting service for fishery research and management

Volume 29(2) 1984

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AQUATIC PLANTS AND THEIR CONTROL

84-000785 Bettoli, P. AQUATIC VEGETATION CONTROL WITH WHITE AMUR IN LAKE CONROE, TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:13. 1983. Abstract only. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-000786 Freeze, M. and S. Henderson. A COMPARISON OF TWO YEAR CLASSES OF HYBRID GRASS CARP AND GRASS CARP FOR AQUATIC PLANT CONTROL. *Proc. Ark. Acad. Sci.* 37:25-30. 1983. SFA 29(2)
[Ark. Game Fish Comm., No. 2 Natural Resources Drive, Little Rock 72205]

84-000787 Higginbotham, B. J.; F. M. Roquette, Jr. and M. J. Florence. FILAMENTOUS ALGAE CONTROL USING *TILAPIA* IN LIVESTOCK WATERING TANKS. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:62-68. 1983. SFA 29(2)
[Prairie View A&M Coop. Ext. Prog., Overton, TX]

GENERAL FISH CULTURE

84-000788 Al Asgah, N. A. and R. M. Bedawi. PRELIMINARY INVESTIGATIONS ON THE SUITABILITY OF GROUND WATER FOR AQUACULTURE IN SAUDI ARABIA. *Aquaculture* 36(4):387-390. 1 Feb. 1984. SFA 29(2)
[R. M. Bedawi: Zool. Dep., Coll. Sci., King Saud Univ., Riyadh, Saudi Arabia] Ground water sampled at five sites in the Al-Quasim region of Saudi Arabia was found to be suitable for the culture of *Tilapia nilotica* in terms of pH, alkalinity, salinity and nitrite-nitrogen. Four of the five sites had very hard water (390-1000 mg/l). Fish growth was low and feed conversion ratios high in preliminary production trials.

84-000789 Bower, C. E. and D. T. Turner. NITRIFICATION IN CLOSED SEAWATER CULTURE SYSTEMS AFTER WASHING OF FILTER BEDS. *Prog. Fish-Cult.* 45(4):198-200. Oct. 1983. SFA 29(2)
[Biol. Dep., Goddard Hall, East. Conn. State Univ., Willimantic, CT 06226]

84-000790 Coche, A. G. (compiler). THE CULTIVATION OF FISH IN CAGES. AN INDEXED BIBLIOGRAPHY 1965-1983. *FAO Fish. Circ.* No. 763. (Rev. 1). iii + 61p. Nov. 1983. SFA 29(2)
[FAO of the UN, Rome, Italy]

84-000791 Duncan, B. L. THE INDONESIA BRACKISHWATER AQUACULTURE PRODUCTION PROJECT COMPLETION REPORT. *Ala. Agric. Exp. Stn. Int. Cent. Aquacult. Res. Dev. Ser.* No. 29. 18p. Nov. 1982. SFA 29(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL]

84-000792 Forneris, G. and E. Parisi. DINAMICA DEL MERCATO DELLE SPECIE ITTICHE D'ACQUA DOLCE IN TORINO DURANTE L'ULTIMO VENTENNIO. [DYNAMICS OF THE MARKET FOR FRESHWATER FISH PRODUCTS IN TORINO DURING THE LAST TWENTY YEARS.] *Riv. Ital. Piscic. Ittiop.* 18(4):133-137. Oct.-Nov.-Dec. 1983. In Italian with English summ. SFA 29(2)
[Ist. Sci., Univ. Torino, Torino, Italy]

GENERAL FISH CULTURE (CONTINUED)

84-000793 Jana, B. B. and S. Sarkar. EVALUATION OF ROCKPHOSPHATE AS A DIRECT APPLICATION FERTILIZER IN AQUACULTURE. *Bamidgeh* 35(4):109-119. Dec. 1983. SFA 29(2)

[Fish. Limnol. Lab., Dep. Zool., Univ. Kalyani, Kalyani 741235, West Bengal, India] The relative efficacy of rockphosphate was tested in outdoor tanks using four treatments, low (50 kg/ha) and high (75 kg/ha) doses of rockphosphate, single superphosphate (50 kg/ha) and control. Although the amount of orthophosphate in the treatment of rockphosphate was much lower than the superphosphate, the phosphorus level in the former was more than 540% higher than the mean value observed in the control. The phytoplankton density, standing crop of algal mat and growth rate of fish in the treatment with low dose (50 kg/ha) rockphosphate was higher than the high dose 75 kg/ha) ones. Application of a fixed dose (50 kg/ha) of rockphosphate with various proportions of sludge (1:0 to 1:10) did not cause marked changes in pH; nonetheless, maximum concentration of orthophosphate was found in the treatments of rockphosphate and sludge in the ratios of 1:4 and 1:6. The regeneration of phosphate from rockphosphate was highly dependent upon the ratio of phosphate to nitrogen as well as phosphorus to exchangeable Ca.

84-000794 Johnson, M. C. COMMERCIAL FISH FARMING PROJECT IN NIGERIA. *Ala. Agric. Exp. Stn. Int. Cent. Aquacult. Res. Dev. Ser.* No. 30. 15p. May 1983. SFA 29(2)

[Dep. Fish. Allied Aquacult., Auburn Univ., Auburn, AL]

84-000795 Linton, T. L. and J. M. Decker. LEGAL ASPECTS OF AQUACULTURE. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:54-61. 1983. SFA 29(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

84-000796 Linton, T. L. and J. Miller. THE HISTORY AND PRESENT STATUS OF THE TEXAS AQUACULTURE INDUSTRY. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:44-53. 1983. SFA 29(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

84-000797 Murnyak, M. O. and D. F. Murnyak. FISH CULTURE IN MINNESOTA FARM PONDS. *J. Minn. Acad. Sci.* 49(1):3-6. 1983-1984. SFA 29(2)

[Aquacult. Dev. Proj., Wright Cty. Commun. Action, Waverly, MN] This paper presents the results of a three year research and extension project in fish farming in central Minnesota. Fifty-seven farm ponds were stocked with one or more of the following species; channel catfish, largemouth bass, rainbow trout, yellow bullheads, bluegill sunfish, and black crappie. Several stocking densities with and without supplemental feeding were tested. The results indicate that when intensively managed, ponds over 0.05 hectare in size and 1 meter in depth are suitable for the production of food fish. Production of harvestable-size fish is possible during a single season when large fingerlings are stocked in early spring. Trout and catfish demonstrated the highest growth rates. Average yields for different production methods ranged from 18 to 356 kg/ha in warm-water ponds and 114 to 880 kg/ha in cold-water ponds. Fish yields were higher in ponds with supplemental feeding than without feeding. Several harvesting methods were tested and analyzed for efficiency. The findings indicate the importance of proper site selection and pond design for the success of an aquaculture operation. Economic analysis revealed the profitability of trout culture, and relatively high production costs for warm water species. Ways to reduce these costs are suggested.

GENERAL FISH CULTURE (CONTINUED)

84-000798 Sarig, S. FISHERIES AND FISH CULTURE IN ISRAEL IN 1982. *Bamidgeh* 35(4):95-108. Dec. 1983. SFA 29(2)
[Lab. Res. Fish Dis., Nir-David, Israel]

84-000799 Stickney, R. R. DEVELOPMENT OF A FRESHWATER FISH HATCHERY/EXTENSION TRAINING CENTER IN THE PHILIPPINES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:88-109. 1983. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-000800 Williams, C. SIMPLE ECONOMICS AND BOOK-KEEPING FOR FISH FARMERS. *FAO Fish. Circ.* No. 763. v + 52p. Dec. 1983. SFA 29(2)
[FAO of the UN, Rome, Italy]

TROUT AND SALMON CULTURE

84-000801 Allen, G. H. and R. A. Gearheart. PUBLIC ASPECTS OF A WASTEWATER BASED CALIFORNIA SALMON RANCHING PROJECT. *Humboldt State Univ. Inst. Res. Creative Proj.* 34p. June 1982. SFA 29(2)
[Fish. Dep., Humboldt State Univ., Arcata, CA] A scheme to utilize wastewater in salmonid aquaculture was proposed initially to the City of Arcata in 1963. Project funding was first obtained in 1969, with first experimental rearing of salmon in July 1971. The first collection of eggs from returning salmon released from the system occurred in 1977. The project's ultimate aim is to market surplus salmon. Porential income exceeding aquaculture operation costs will be applied to wastewater treatment costs. When this occurs the project would be meeting a major national objective of the United States Clean Water Act of 1972 (PL 92-500). This paper describes the present status of the project in meeting public health requirements needed for final authorization of wastewater-based salmon ranching operation. Only those parameters used to monitor water and food to protect the public against bacterial and viral contaminants are considered in detail.

84-000802 McNeil, W. J. SALMON RANCHING: A GROWING INDUSTRY IN THE NORTH PACIFIC. *Oceanus* 27(1):27-31. 1984. SFA 29(2)

84-000803 Salojärvi, K. SIIAN LUONNONRAVINTOLAMMIKKOVILJELY JA KESÄNVANHOJEN POIKASTEN ISTUTUSTEN TULOKSET POHJOIS-SUOMEN SISÄVESISSÄ. [REARING OF WHITEFISH FINGERLINGS IN NATURAL FOOD PONDS AND STOCKING OF INLAND WATERS WITH ONE-SUMMER OLD FINGERLINGS IN NORTHERN FINLAND.] *Suom. Kalatalous* No. 51. p. 51-66. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkumusosasto, PL 193, 00131 Helsinki 13, Finland]

84-000804 Sonski, A. J. CULTURE OF REDBAND TROUT AT A WARM-WATER HATCHERY. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:21-40. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Heart of the Hills Fish. Res. Stn., Ingram 78025] Fingerling redband trout (*Salmo* sp.) were reared in earthen ponds during a winter and indoor tanks the following summer at a hatchery in central Texas to produce broodstock. Mean daily surface temperature ranged between 49 and 80°F in ponds and between 67 and 75°F in tanks. While in ponds, fish grew from a mean total length of 5.9 in and a mean weight of

TROUT AND SALMON CULTURE (CONTINUED)

84-000804 CONTINUED 0.08 lb to 12.3 in and 0.74 lb. After over-summering in indoor tanks mean fish length was 15.2 in and mean weight 1.55 lb. Mean daily growth rates during pond and tank culture were 0.04 in and 0.004 lb and 0.02 in and 0.004 lb, respectively. Mean condition factors were 3774.02×10^{-7} for fish reared in ponds and 3823.90×10^{-7} for fish reared in tanks. Survival averaged 65.1% in ponds and 90.4% in tanks. There were no disease problems in ponds; diseases were minimal in tanks.

84-000805 Tucker, C. S. (ed.) WATER QUALITY IN CHANNEL CATFISH PONDS. A REPORT FROM THE WATER QUALITY SUBCOMMITTEE OF REGIONAL RESEARCH PROJECT S-168. *Miss. Agric. For. Exp. Stn. Bull.* 290. 53p. Dec. 1983. SFA 29(2)
Available from Miss. Agric. For. Exp. Stn., P.O. Box 5168, Mississippi State 39762]

WARMWATER CULTURE

84-000806 Bensam, P. and R. Marichamy. AN EXPERIMENT ON CULTURE OF MILKFISH *CHANOS CHANOS* (FORSKAL) IN SALT-PANS AT VEPPALODAI, TUTICORIN. *Indian J. Fish.* 28(1-2):266-269. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Tuticorin Cent., India] Constructing ponds in a primary reservoir storing sea water in production of common salt, an experiment was carried out during 1973-1974 on culture of *Chanos*, without undertaking much managment procedures or supplementary feeding. In one pond with stocking rate of about 75,490/ha, survival was about 44% and production was about 857 kg/ha/14 months, while in another pond with stocking rate of about 7,820/ha, survival was about 85% but production was only 318 kg/ha/11 months.

84-000807 Bok, A. H. EXTENSIVE CULTURE OF TWO MULLET SPECIES IN FRESHWATER IMPOUNDMENTS IN THE EASTERN CAPE. *S. Afr. J. Zool.* 19(1):31-36. Jan. 1984. In English with Afrikaans summ. SFA 29(2)
[Cape Dep. Nat. Environ. Conserv., P. B. 1006, Grahamstown, 6140 South Africa] The feasibility of using freshwater mullet *Myxus capensis* and flathead mullet *Mugil cephalus* to increase the fisheries potential of freshwater impoundments was investigated. The recruitment periods of fry of both species into the upper reaches of a number of eastern Cape estuaries were established. Techniques used to minimize mortalities during the capture, transportation and stocking of the fry are described. Data on growth and mortality of both species of mullet fry stocked into a variety of impoundments are discussed with regard to their potential for extensive aquaculture and angling purposes.

84-000808 Carreon, J. A.; L. V. Laureta; F. A. Estocapio and T. U. Abalos. MILKFISH SEEDLING SURVIVAL IN RACEWAYS OF FRESHWATER RECIRCULATING SYSTEMS. *Aquaculture* 36(3):257-272. 15 Jan. 1984. SFA 29(2)
[Inst. Fish. Dev. Res., UPV Coll. Fish., Univ. Philippines, Diliman, Quezon City, 3004, Philippines]

84-000809 Dupree, H. K. and J. V. Huner. THIRD REPORT TO THE FISH FARMERS. THE STATUS OF WARMWATER FISH FARMING AND PROGRESS IN FISH FARMING RESEARCH. *U.S. Fish Wildl. Serv.* vi + 270p. 1984. SFA 29(2)

WARMWATER CULTURE (CONTINUED)

84-000810 Espinach Ros, A.; V. G. Amutio; J. P. Mestre Arceredillo; G. Orti and A. Nani. INDUCED BREEDING OF THE SOUTH AMERICAN CATFISH, *RHAMDIA SAPO* (C. & V.). *Aquaculture* 37(2):141-146. 1 Mar. 1984. SFA 29(2)
[Dir. Nac. Pesca Cont., Dep. Invest. Pesq., (1060) Santa Fe 1548, Buenos Aires, Argentina]

84-000811 Folz, D. J.; D. G. Czeskleba and T. F. Thuemler. ARTIFICIAL SPAWNING OF LAKE STURGEON IN WISCONSIN. *Prog. Fish-Cult.* 45(4):231-233. Oct. 1983. SFA 29(2)
[Wis. Dep. Nat. Resour., Oshkosh 54903]

84-000812 Freeze, M. and S. Henderson. SPAWNING THE GRASS CARP FEMALE X BIGHEAD CARP MALE. *Proc. Ark. Acad. Sci.* 37:31-33. 1983. SFA 29(2)
[Ark. Game Fish Comm., No. 2 Natural Resources Dr., Little Rock 72205]

84-000813 Green, B. W. and R. O. Smitherman. RELATIVE GROWTH, SURVIVAL AND HARVESTABILITY OF BIGHEAD CARP, SILVER CARP, AND THEIR RECIPROCAL HYBRIDS. *Aquaculture* 37(1):87-95. 15 Feb. 1984. SFA 29(2)
[Dep. Fish. Allied Aquacult., Ala. Agric. Exp. Stn., Auburn Univ., AL 36849] Growth and survival in the primary rearing phase (42 days) for bighead carp, silver carp, bighead x silver carp (BHC x SC), and silver x bighead carp (SC x BHC) in ponds and concrete tanks stocked at 370,500 fry/ha were studied. Mean survival for fishes in ponds was 93%, that in tanks was 73%. Yields among all fishes averaged 338 kg/ha. The growth rates of fishes in ponds were similar; in tanks, silver carp grew faster than the bighead carp. Growth, survival, and harvestability by seine during the secondary rearing phase (60-day duration) for the same groups of fish were studied. Fingerlings (0.9 g mean weight) were stocked in earthen ponds at 49,400 fish/ha and 98,800 fish/ha. Mean survival of fishes at low stocking rate was 77%, similar to that (71%) for the high stocking rate. Fish yields were similar at the low stocking rate. At the high rate, the BHC x SC yield (846 kg/ha) was greater than the SC x BHC yield (582 kg/ha). The BHC x SC and SC x BHC had greater mean weights at low stocking rate than at high stocking rate. The mean weights for bighead carp were similar at both rates. Bighead carp and the reciprocal hybrids were more easily harvested by seine than silver carp.

84-000814 Greenland, D. C.; W. R. Robison and S. H. Newton. SIZE VARIATION OF UNGRADED AND GRADED CHANNEL CATFISH REARED IN CAGES. *Proc. Ark. Acad. Sci.* 37:34-35. 1983. SFA 29(2)
[U.S. FWS, Fish. Farm. Exp. Stn., Stuttgart, AR 72160] Graded and ungraded channel catfish (*Ictalurus punctatus*) fingerlings stocked in three partitioned floating cages were reared for 140 days during the summer, 1982. Fish were fed to satiation once daily with commercial pelleted ration. At harvest, graded fish averaged 403 g and ungraded 362 g. Coefficients of variation indicated graded fish were more uniform in size and a significantly greater proportion of the graded fish were of salable size (≥ 340 g).

84-000815 Higginbotham, B. J.; R. L. Noble and A. Rudd. CULTURE TECHNIQUES OF FORAGE SPECIES COMMONLY UTILIZED IN TEXAS WATERS. *Proc. Fish Farm. Conf. Annu. Conv. Fish. Farm. Tex.* 1983:5-20. 1983. SFA 29(2)
[Prairie View A & M Coop. Ext. Serv., Overton, TX]

84-000816 Jones, J. B.; M. Astill and E. Kerei. THE POND CULTURE OF *ANGUILLA AUSTRALIS* IN NEW ZEALAND - WITH SPECIAL REFERENCE TO TECHNIQUES AND MANAGEMENT OF THE EXPERIMENTAL FARM AT TE KAHA, BAY OF PLENTY. *Riv.*

WARMWATER CULTURE (CONTINUED)

84-000816 CONTINUED *Ital. Piscic. Ittiop.* 18(4):138-166. Oct.-Nov.-Dec. 1983. In English and Italian. SFA 29(2)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 297, Wellington, New Zealand]

84-000817 Jones, J. B.; M. Astill and E. Kerei. THE POND CULTURE OF *ANGUILLA AUSTRALIS* IN NEW ZEALAND--WITH SPECIAL REFERENCE TO TECHNIQUES AND MANAGEMENT OF THE EXPERIMENTAL FARM AT THE KAHA, BAY OF PLENTY. *Riv. Ital. Piscic. Ittiop.* 18(3):85-117. July-Aug.-Sept. 1983. In Italian and English. SFA 29(2)
[Fish. Res. Div., Minist. Agric. Fish., P.O. Box 297, Wellington, New Zealand]

84-000818 Kulzer, K. E. FLATHEAD CATFISH EGG PROCUREMENT. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:17. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Ingram 78025] Hormone injection of wild flathead catfish (*Pylodictus olivaris*) and subsequent spawning in hatchery holding troughs was investigated as a potentially efficient method for obtaining fertilized flathead catfish eggs. Different hormone dosages and, in many cases, multiple injections were administered. Thirty spawns were obtained from 88 pairs of fish. A dose of 700-800 IU/454 gm of body weight of human chorionic gonadotropin was most effective. This was followed by a second injection of 500 IU/454 gm of body weight 48 hours later if spawning had not occurred within that time. Egg diameter and external appearance of female genitalia were evaluated as possible criteria for determining spawning readiness. Egg diameters of fish spawning within 48 hours after a single injection were significantly greater than those for fish that had not spawned; 67% of the spawning fish had egg diameters ≥ 3.5 mm.

84-000819 Mallah, M. F. A. and E. S. P. Tan. EFFECTS OF FEEDING FREQUENCY ON THE GROWTH AND SURVIVAL OF CATFISH (*CLARIAS MACROCEPHALUS* GUNTHER) LARVAE. *Indian J. Fish.* 29(1-2):1-7. 1982. SFA 29(2)
[Sch. Biol. Sci., Univ. Sains Malaysia, Penang, Malaysia]

84-000820 Robison, W. R.; S. H. Newton and M. V. Meisch. MOSQUITOFISH PRODUCTION IN MONOCULTURE AND POLYCULTURE PONDS. *Proc. Ark. Acad. Sci.* 37:101-103. 1983. SFA 29(2)
[Dep. Agric., Univ. Ark., Pine Bluff 71601]

84-000821 Tomasso, J. R. and G. J. Carmichael. USE OF FORMALIN TO SEPARATE TADPOLES FROM LARGEMOUTH BASS FINGERLINGS AFTER HARVESTING. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:18. 1983. Abstract only. SFA 29(2)
[Southwest Tex. State Univ., San Marcos 78666] Tadpoles of the Rio Grande leopard frog (*Rana berlandieri*) and fingerling largemouth bass (*Micropterus salmoides*) were exposed to formalin to test the ability of the chemical to selectively kill tadpoles without harming fish. Exposure of a mixture of tadpoles and fingerlings to 60 µl/l formalin for 24 hours killed 100% of tadpoles while all fingerlings survived the exposure period. Three percent of the bass died within the 5 days following exposure. In tests using 200 µl/l of formalin for 1 hour and then diluting the solutions at the rate of 1.2 turnovers per hour, we killed all of the tadpoles within 24 hours of the initial exposure. All of the bass survived the exposure and survived the 5 days following the exposure that they were monitored. These data indicate that formalin can be used to selectively separate largemouth bass fingerlings from tadpoles after harvesting.

MARICULTURE

84-000822 Bauereis, E. I. and J. N. Kraeuter. POWER PLANTS AND STRIPED BASS: A PARTNERSHIP. *Oceanus* 27(1):40-45. 1984. SFA 29(2)
[Environ. Proj. Unit, Baltimore Gas Electric Co., Baltimore, MD]

84-000823 Chattopadhyay, G. N. and L. N. Mandal. INFLUENCE OF MANURE AND FERTILIZERS ON SOME CHEMICAL AND BIOLOGICAL PROPERTIES OF SOIL AND WATER OF A BRACKISHWATER FISH POND. *Indian J. Fish.* 29(1-2):191-200. 1982. SFA 29(2)
[Cent. Inland Fish. Res. Inst., Barrackpore, India]

FEEDS, FEEDING, AND NUTRITION

84-000824 Akiyama, T.; T. Murai; Y. Hirasawa and T. Nose. SUPPLEMENTATION OF VARIOUS MEALS TO FISH MEAL DIET FOR CHUM SALMON FRY. *Aquaculture* 37(3):217-222. 15 Mar. 1984. SFA 29(2)
[Fish Nutr. Div., Natl. Res. Inst. Aquacult., Tamaki, Mie 519-04, Japan] In a 6-week feeding experiment, chum salmon, *Oncorhynchus keta*, swim-up fry, were fed fish meal diets supplemented with silkworm paupae powder (5%), dried beef liver (5%), krill meal (5%) or earthworm powder (5%) at the expense of fish meal, or substituting glucose (13%) for dextrin. Fish fed the diet with earthworm powder showed the best growth performance (675% weight gain in 6 weeks) and feed efficiency (117%). The growth rate and feed efficiency of the krill meal group were also significantly better than those of the control group (without supplement or subsitution). Substitution of glucose and supplementation of silkworm pupae or beef liver failed to improve the growth rate, but significantly improved feed efficiency. Food consumption of fish fed the diet supplemented with earthworms was lowest, and none of the dietary treatments appreciably increased food intake of the fish over that of the control group. The dietary group receiving earthworm powder also showed significantly higher body fat content than the remaining dietary groups. No significant differences were noted in body protein and ash contents among all dietary treatments.

84-000825 Barahona-Fernandes, M. H. CROISSANCE COMPARÉE OBTENUE AVED DES ALIMENTS COMPOSÉS ET NATURELS CHEZ LE BAR (*DICENTRARCHUS LABRAX*) EN ÉLEVAGE. [GROWTH COMPARISONS WITH NATURAL AND ARTIFICIAL FOODS WITH JUVENILE SEA BASS (*DICENTRARCHUS LABRAX*).] *Arq. Mus. Bocage Ser. B* 2(7):41-46. 1982. In French with English summ. SFA 29(2)
[Fac. Cienc., Dep. Zool., 1200 Lisbon, Portugal] Five experiments were made in order to compare both the survival and the growth obtained in juvenile sea bass batches fed with artificial pellets and with natural food. The results show no significant difference on the growth and a similar final survival.

84-000826 Bromley, P. J. and T. C. Adkins. THE INFLUENCE OF CELLULOSE FILLER ON FEEDING, GROWTH AND UTILIZATION OF PROTEIN AND ENERGY IN RAINBOW TROUT, *SALMO GAIRDNERII* RICHARDSON. *J. Fish Biol.* 24(2):235-244. Feb. 1984. SFA 29(2)
[Fish. Lab., Pakefield Rd., Lowestoft, Suffolk NR33 0HT, England] A nutrient source was diluted with indigestible filler in the form of

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

84-000826 CONTINUED α-cellulose. The trout compensated for up to 30% cellulose by increasing the total weight of food eaten, thereby stabilizing both nutrient intake and growth rate. The fish failed to compensate for levels of 40-50% cellulose and, despite evidence for an increase in the size of the stomach, nutrient intake was approximately halved. There was a slight reduction in food conversion efficiency and the growth rate declined accordingly. By contrast, faecal output rose considerably.

84-000827 Buddington, R. K. and S. I. Doroshov. FEEDING TRIALS WITH HATCHERY PRODUCED WHITE STURGEON JUVENILES *(ACIPENSER TRANSMONTANUS). Aquaculture* 36(3):237-243. 15 Jan. 1984. SFA 29(2)

[Aquacult. Prog., Anim. Sci. Dep., Univ. Calif., Davis 95616] Growth and survival of white sturgeon larvae were examined at ad libitum feeding with three commercial salmonid diets, an experimental crustacean diet, and a live food control (tubifex). The results demonstrated that some manufactured diets particularly a semi-moist ration, can be used to rear white sturgeon during the first 40 days of feeding. Although specific growth rates of fish fed a semi-moist feed were 40% lower than those fed live foods, survival rates were similar. The high mortality previously associated with later transfer of fish from live foods to manufactured diets was avoided. Dry diets were not well accepted and resulted in lower rates of growth and survival.

84-000828 Dean, J. C. and H. R. Robinette. EFFECT OF HIGH-LYSINE CORNS AND LYSINE SUPPLEMENTS ON GROWTH OF FINGERLING CATFISH FED PRACTICAL DIETS. *Prog. Fish-Cult.* 45(4):225-227. Oct. 1983. SFA 29(2)

[Okla. Dep. Wildl. Conserv., Oklahoma City 73105]

84-000829 Dosanjh, B. S.; D. A. Higgs; M. D. Plotnikoff; J. R. McBride; J. R. Markert and J. T. Buckley. EFFICACY OF CANOLA OIL, PORK LARD AND MARINE OIL SINGLY AND IN COMBINATION AS SUPPLEMENTAL DIETARY LIPID SOURCES FOR JUVENILE COHO SALMON (*ONCORHYNCHUS KISUTCH*). *Aquaculture* 36(4):333-345. 1 Feb. 1984. SFA 29(2)

[West Vancouver Lab., 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

84-000830 Hepher, B. and S. Sandbank. THE EFFECT OF PHOSPHORUS SUPPLEMENTATION TO COMMON CARP DIETS ON FISH GROWTH. *Aquaculture* 36(4):323-332. 1 Feb. 1984. SFA 29(2)

[Fish Aquacult. Res. Stn., Dor Israel]

84-000831 Niamat, R. and A. K. Jafri. GROWTH RESPONSE OF THE SILUROID, *HETEROPNEUSTES FOSSILIS* BLOCH, FED PELLETED FEED. *Aquaculture* 37(3):223-229. 15 Mar. 1984. SFA 29(2)

[Fish. Res. Lab., Dep. Zool., Aligarh Muslim Univ., Aligarh 202 001, India] Growth response and survival of catfish, *Heteropneustes fossilis*, fed compounded pelleted diet have been studied. It was observed that the fish accepts and thrives well on pelleted feed, with 100% survival. The conversion factor of the feed over a 6-week feeding trial was found to be 1.8, corresponding to gross growth efficiency of 0.56. The study suggests that cost-effective raw materials could be used for compounding nutritive feed for this species.

84-000832 Robinson, E. H.; S. D. Rawles and R. R. Stickney. CATFISH BROODFISH FEEDING STUDIES. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:88-93. 1983. SFA 29(2)

[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

FEEDS, FEEDING, AND NUTRITION (CONTINUED)

84-000833 Robinson, E. H. and H. K. Dupree. GUIDELINES FOR SELECTING FEEDS AND TECHNIQUES OF FEEDING. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:69-81. 1983. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

84-000834 Satoh, S.; T. Takeuchi; Y. Narabe and T. Watanabe. [EFFECTS OF DELETION OF SEVERAL TRACE ELEMENTS FROM FISH MEAL DIETS ON GROWTH AND MINERAL COMPOSITION OF RAINBOW TROUT FINGERLINGS.] *Bull. Jpn. Soc. Sci. Fish.* 49(12):1909-1916. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Lab. Fish Nutr., Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

84-000835 Schwarts, J. P. FEEDING AND GROWTH RATES OF PINK SALMON FRY FED ON OIL-CONTAMINATED PREY. *Proc. Alaska Sci. Conf.* 34:125. 1983. Abstract only. SFA 29(2)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701]

84-000836 Sen, P. R.; N. G. S. Rao and A. N. Mohanty. RELATIONSHIP BETWEEN RATE OF FEEDING, GROWTH AND CONVERSION IN MAJOR INDIAN CARPS. *Indian J. Fish.* 27(1-2):201-208. 1980. SFA 29(2)
[Cent. Inland Fish. Res. Substn., Cuttack, Orissa, India]

84-000837 Singh, B. N.; V. R. P. Sinha and D. P. Chakraborty. FEED INTAKE, ABSORPTION, CONVERSION AND GROWTH OF FRY AND FINGERLINGS OF ROHU *LABEO ROHITA* (HAMILTON). *Indian J. Fish.* 27(1-2):193-200. 1980. SFA 29(2)
[Cent. Inland Fish. Res. Inst., Barrackpore, India]

84-000838 Walton, M. J.; C. B. Cowey and J. W. Adron. EFFECTS OF BIOTIN DEFICIENCY IN RAINBOW TROUT (*SALMO GAIRDNERI*) FED DIETS OF DIFFERENT LIPID AND CARBOHYDRATE CONTENT. *Aquaculture* 37(1):21-38. 15 Feb. 1984. SFA 29(2)
[N.E.R.C. Inst. Mar. Biochem., St. Fittick's Rd., Aberdeen AB1 3RA, Scotland]

84-000839 Winfree, R. A. and R. R. Stickney. FEEDING YOUNG CHANNEL CATFISH. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:82-87. 1983. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A&M Univ., College Station 77843]

TRANSPORTING FISH

84-000840 Soivio, A. and M. Nikinmaa. KIRJOLOHEN FYSIOLOGISESTA TILASTA KULJETUKSEN JA SITÄ SEURAAVAN TOIPUMISEN AIKANA. [THE PHYSIOLOGICAL CONDITION OF RAINBOW TROUT DURING TRANSPORT AND THE SUBSEQUENT RECOVERY PERIOD.] *Suom. Kalatalous* No. 49. p. 49-56. 1983. In Finnish with English summ. SFA 29(2)
[Helsingin Yliopiston Eläintieteen laitos, Fysiol. Osasto, Arkadiankatu 7, 00100 Helsinki 10, Finland] The physiological condition of rainbow trout was investigated during 6-hour transport and a subsequent 3-day recovery period. The most pronounced changes in the physiological

TRANSPORTING FISH (CONTINUED)

84-000840 CONTINUED parameters during transport were increases in the blood lactate and plasma potassium ion concentrations, and dilution of the blood, evident as decreases in its oxygen-carrying capacity, and in the plasma concentrations of protein and major ions. During the recovery period of the blood lactate concentration returned to the normal level within 24 hours, whereas the dilution of the blood persisted throughout the period. This dilution was probably due to the osmotic stress experienced by the fish. Osmotic stress, together with depletion of the energy stores, may be a major factor responsible for the high mortality in the recovery period. It is suggested that the general transport stress can be diminished by lowering the transport temperatures. To diminish the osmotic stress, the fish could be transported in salt water and allowed to recover in brackish water.

AQUARIUMS

84-000841 Baugh, T. M. and J. E. Deacon. MAINTAINING THE DEVIL'S HOLE PUPFISH, *CYPRINODON DIABOLIS* WALES IN AQUARIA. *J. Aquaricult. Aquatic Sci.* 3(4):73-75. 1983. SFA 29(2)
[Dep. Biol. Sci., Univ. Nevada, Las Vegas 89154]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT

84-000842 Boyd, C. E. and D. J. Martinson. EVALUATION OF PROPELLER-ASPIRATOR-PUMP AERATORS. *Aquaculture* 36(3):283-292. 15 Jan. 1984. SFA 29(2)
[Dep. Fish. Allied Aquacult., Agric. Exp. Stn., Auburn Univ., Auburn, AL 36849] Propeller-aspirator-pump aerators of 0.38, 1.5, and 2.24 kW transferred averages of 1.73 to 1.91 kg oxygen/kW•h in standardized oxygen transfer tests (tap water; 20°C; 0 mg/l dissolved oxygen) conducted in a shallow basin (1.04 m of water depth). In comparison tests, spray-type surface aerators transferred 1.34 to 1.41 kg oxygen/kW•h and a diffused-air system transferred 1.08 kW•h. The water-mixing capabilities of aerators were estimated from the time to completely mix salt (NaCl) throughout the volumes of ponds, and from the time required to spread a dye over surfaces of ponds. The propeller-aspirator-pump was effective in mixing pond water. A 1.5-kW propeller-aspirator-pump spread dye over a 0.4-ha pond in 32 min and mixed salt throughout 3000 m^3 of water in 90 min. A larger spray-type surface aerator (2.24 kW) required 1.5 h to spread dye and 1.75 h to mix salt in the same pond.

84-000843 Fujita, T.; M. Satake; T. Watanabe; C. Kitajima; W. Miki; K. Yamaguchi and S. Konosu. PIGMENTATION OF CULTURED RED SEA BREAM WITH ASTAXANTHIN DIESTER PURIFIED FROM KRILL OIL. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1855-1861. Dec. 1983. SFA 29(2)
[Cent. Res. Lab., Nippon Suisan Karsha, Ltd., Hachioji, Tokyo 192, Japan]

84-000844 Fujita, T.; M. Satake; S. Hikichi; M. Takeda; S. Shimeno; H. Kuwabara; W. Miki; K. Yamaguchi and S. Konosu. PIGMENTATION OF CULTURED YELLOWTAIL WITH KRILL OIL. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1595-1600. Oct. 1983. SFA 29(2)
[Cent. Res. Lab., Nippon Suissan Kaisha, Ltd., Hachioji, Tokyo 192, Japan]

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

84-000845 Geiger, J. G. and N. C. Parker. FIELD EVALUATION OF A POND AERATION SYSTEM. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:41-43. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin 78744]

84-000846 Jensen, J. O. T. and D. F. Alderdice. EFFECT OF TEMPERATURE ON SHORT-TERM STORAGE OF EGGS AND SPERM OF CHUM SALMON *(ONCORHYNCHUS KETA). Aquaculture* 37(3):251-265. 15 Mar. 1984. SFA 29(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Chum salmon (*Oncorhynchus keta*) gametes were stored separately for intervals up to 460 h at temperature ranging from 3 to 15°C. Estimates of time to 90 and 50% fertilization success (FS) were obtained for either stored eggs, stored milt, or stored eggs and milt. When both gametes were stored, the combined loss of gamete viability resulted in shorter times to 90 and 50% FS than when either eggs or milt were stored alone. Gamete storage at colder temperatures significantly prolonged viability; for example, when both gametes were stored, the time to 90% FS ranged from 19.6 h (15°C), to 123.9 h (3°C). Loss of viability of stored gametes in these trials was similar to that found in other studies with *Oncorhynchus* species at low storage temperatures (3-6°C), but gametes showed significantly greater viability when stored at higher temperatures (9-15°C). This increased viability in the current study appears to have resulted from the provision of (1) higher air-to-gamete ratios, and (2) greater interface area between air and gametes in the storage containers, two factors that would enhance gamete respiration during storage.

84-000847 Kurokura, H.; R. Hirano; M. Tomita and M. Iwahashi. CRYOPRESERVATION OF CARP SPERM. *Aquaculture* 37(3):267-273. 15 Mar. 1984. SFA 29(2)
[Fac. Appl. Biol. Sci., Hiroshima Univ., Fukuyama-shi, Hiroshima-ken, 720, Japan]

84-000848 McAllister, P. E.; S. R. Phelps; W. J. Owens and G. A. Wilson. INCUBATOR-AQUARIUM FOR SMALL-SCALE EGG INCUBATION AND REARING OF FRY AND FINGERLINGS. *Prog. Fish-Cult.* 45(4):200-202. Oct. 1983. SFA 29(2)
[U.S. FWS, Natl. Fish Health Res. Lab., Box 700, Kearneysville, WV 25430]

84-000849 Mundie, J. H. and R. E. Traber. FLOATING PEN FOR HOLDING SALMONID FRY IN RUNNING WATER. *Prog. Fish-Cult.* 45(4):217. Oct. 1983 SFA 29(2)
[Dep. Fish. Oceans, Fish. Res. Br., Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-000850 Pohar J. and A. Pen. USE OF PHOTOCOPYING FOR COUNTING SALMONID EGGS. *Prog. Fish-Cult.* 45(4):234-236. Oct. 1983. SFA 29(2)
[Zootech. Dep., Univ. E. Kardelj Ljubljana, Groblje 3, 61230 Domzale, Jugoslavia]

84-000851 Prasad, R. R. NOTE ON THE CONTROL OF PREDATORY AQUATIC INSECTS IN NURSERY PONDS. *Indian J. Fish.* 28(1-2):259-261. 1981. SFA 29(2)
[Fish Farm. Dev. Agency, Santhal Pargana, Dumka-814 101, India] The efficacy of kerosin oil in the control of aquatic insects causing considerable damage to carp fry in the nursery ponds has been tested and found equally good with other existing methods.

MISCELLANEOUS CULTURE TECHNIQUES AND EQUIPMENT (CONTINUED)

84-000852 Sleet, R. B. and K. Brendel. A FLOW-THROUGH HATCHING AND COLD STORAGE SYSTEM FOR CONTINUOUS COLLECTION OF FRESHLY HATCHED *ARTEMIA* NAUPLII. *J. Aquaricult. Aquatic Sci.* 3(4):76-83. 1983. SFA 29(2)

[Dep. Pharmacol., Ariz. Health Sci. Cent., Tucson 85724] A flow-through hatching and cold storage system for collecting large, homogenous populations of freshly hatched *Artemia* nauplii is described. Freshly hatched nauplii are captured and transported to 4°C storage by fluid flowing through the hatching vessel. Hatching started 16 to 18 hours after the onset of cyst incubation at 31°C and almost 70 percent of the population accumulated over 72 hours of incubation hatched within two days. With continuous collection, the accumulated population consisted of nauplii ranging in exposure duration to 4°C. If post cold storage viability and development of nauplii were altered by cold storage, then the population collected from the system could exhibit marked heterogeneity due to variation in exposure duration. The effects of prolonged 4°C storage on naupliar viability and development was studied. Viability and development of nauplii collected within 48 hours of incubation were not adversely affected by accumulation at 4°C or additional 4°C storage for up to 96 hours. The population accumulated within 48 hours was homogeneous based on uniformity in variation of body length measured throughout additional cold storage.

84-000853 Turner, D. T. and C. E. Bower. REMOVAL OF SOME INORGANIC AND ORGANIC SUBSTANCES FROM FRESH WATER AND ARTIFICIAL SEAWATER BY TWO COMMERCIAL FILTRANTS. *J. Aquaricult. Aquatic Sci.* 3(4):57-63. 1983. SFA 29(2)

[Biol. Dep., East. Conn. State Univ., Willimantic 06226] Two commercial filtrants, Poly-Filter (PF) and Chemi-Pure (CP), were tested for their ability to remove certain inorganic and organic substances from fresh water and artificial seawater in recirculating culture systems. Neither product reduced the concentration of ammonia, nitrite, or nitrate in seawater, but CP removed 86 percent of the ammonia and PF removed 10 percent or less of the nitrite and nitrate from fresh water. Both PF and CP removed unchelated copper (copper sulfate) from fresh water and seawater, but only PF substantially decreased the concentrations of chelated copper from a commercial formulation. Approximately 10 percent and 100 percent of added methylene blue were removed by PF and CP, respectively. Both filtrants effectively removed malachite green from solution, but comparable removal also occurred in the controls, which contained crushed glass and polyester fiber.

84-000854 Van De Elst, R. P.; J. A. Ballard; A. P. Bowmaker; G. Cliff; P. A. Garratt and G. D. Thurman. FORCE FEEDING OF A CAPTIVE TIGER SHARK (*GALEOCERDO CUVIERI* (LESUER)) AND ITS RESPONSE TO DIFFERENT FOOD TYPES PRESENTED. *J. Aquaricult. Aquatic Sci.* 3(4):71-72. 1983. SFA 29(2)

[Oceanogr. Res. Inst., P.O. Box 10712, Marine Parade, 4056 Durban, South Africa] Sharks are generally difficult to maintain in captivity and success in keeping them has been reported for comparatively few species. Yet live sharks are valued subjects for research and popular as display animals, especially the tiger shark, *Galeocerdo cuvieri* (Lesuer). A description is given on the force feeding and subsequent voluntary ingestion of mammalian food by a 1.02 m tiger shark. Although the shark died after 119 days due to swallowing an abnormally large bone, the authors are optimistic about future attempts to feed tiger sharks in captivity.

BENTHOS

84-000855 Hiltunen, J. K. VERSATILE BUCKET FOR SIEVING BENTHOS SAMPLES. *Prog. Fish-Cult.* 45(4):229-231. Oct. 1983. SFA 29(2)

[U.S. FWS, Great Lakes Fish. Lab., Ann Arbor, MI 48105]

PLANKTON

84-000856 Farquhar, B. W. A PORTABLE ZOOPLANKTON SAMPLING APPARATUS FOR HATCHERY PONDS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:19. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Fort Worth 76114]

MORPHOLOGY

84-000857 Al-Kadhomiy, N. K. VASCULAR PATHWAYS IN THE GILL FILAMENTS OF THE FLOUNDER, *PLATICHTHYS FLESUS* L. *J. Fish Biol.* 24(1):105-114. Jan. 1984. SFA 29(2)
[Res. Unit Comp. Anim. Respir., Univ. Bristol, Woodland Rd., Bristol BS8 1UG, England]

84-000858 Asahina, K.; K. Uematsu and K. Aida. STRUCTURE OF THE TESTIS OF THE GOBY *GLOSSOGOBIUS OLIVACEUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1493-1498. Oct. 1983. SFA 29(2)
[Coll. Agric. Vet. Med., Nihon Univ., Setagaya, Tokyo 154, Japan]

84-000859 Bell, M. A. and J. V. Baumgartner. AN UNUSUAL POPULATION OF *GASTEROSTEUS ACULEATUS* FROM BOSTON, MASSACHUSETTS. *Copeia* 1984(1):258-262. 23 Feb. 1984. SFA 29(2)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

84-000860 Bell, M. A. LATERAL PLATE POLYMORPHISM AND ONTOGENY OF THE COMPLETE PLATE MORPH OF THREESPINE STICKLEBACKS (*GASTEROSTEUS ACULEATUS*). *Evolution* 35(1):67-74. Jan. 1981. SFA 29(2)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

84-000861 Bemis, W. E. MORPHOLOGY AND GROWTH OF LEPIDOSIRENID LUNGFISH TOOTH PLATES (PISCES: DIPNOI). *J. Morphol.* 179(1):73-93. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Calif., Berkeley 94720]

84-000862 Bemis, W. E. STUDIES ON THE EVOLUTIONARY MORPHOLOGY OF LEPIDOSIRENID LUNGFISH (PISCES: DIPNOI). *Ph.D. dissertation, Univ. Calif. (Berkeley)* 346p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(8):2355. Feb. 1984. SFA 29(2)

84-000863 Benz, G. W. ON THE CONSERVATIVE NATURE OF THE GILL FILAMENTS OF SHARKS. *Environ. Biol. Fishes* 10(1-2):111-116. 15 Feb. 1984. SFA 29(2)
[Biol. Sci. Group, Univ. Conn., Storrs 06268]

84-000864 Branchek, T. and R. Bremiller. THE DEVELOPMENT OF PHOTORECEPTORS IN THE ZEBRAFISH, *BRANCHYDANIO RERIO*. I. STRUCTURE. *J. Comp. Neurol.* 224(1):107-115. 20 Mar. 1984. SFA 29(2)
[Inst. Molec. Biol., Univ. Oreg., Eugene 97403]

84-000865 Coad, B. W. PLATE MORPHS IN FRESHWATER SAMPLES OF *GASTEROSTEUS ACULEATUS* FROM ARCTIC AND ATLANTIC CANADA: COMPLEMENTARY COMMENTS ON A RECENT CONTRIBUTION. *Can. J. Zool.* 61(5):1174-1177.

MORPHOLOGY (CONTINUED)

84-000865 CONTINUED May 1983. In English with French summ. SFA 29(2)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada]

84-000866 Colombo, G.; G. Grandi and R. Rossi. GONAD DIFFERENTIATION AND BODY GROWTH IN *ANGUILLA ANGUILLA* L. *J. Fish Biol.* 24(2):215-228. Feb. 1984. SFA 29(2)
[Ist. Zool., Univ. Ferrara, 44100 Ferrara, Via L. Borsari 46, Italy]

84-000867 Colville, T. P. DISTRIBUTION OF RENAL CORPUSCLES IN THE KIDNEY OF RAINBOW TROUT. *Copeia* 1984(1):264. 23 Feb. 1984. SFA 29(2)
[Dep. Vet. Sci., Univ. Stirling, Stirling FK9 4LA, Scotland]

84-000868 Derivot, J. H. FUNCTIONAL ANATOMY OF THE PERIPHERAL OLFACTORY SYSTEM OF THE AFRICAN LUNGFISH *PROTOPTERUS ANNECTENS* OWEN: MACROSCOPIC, MICROSCOPIC, AND MORPHOMETRIC ASPECTS. *Am. J. Anat.* 169(2):177-192. Feb. 1984. SFA 29(2)
[Lab. Ecophysiol. Nerv. Endocrin., U.E.R. Sci., Ave. Valrose, 06100 Nice, France]

84-000869 Devadoss, P. ON THE EMBRYONIC STAGE OF THE MOTTLED RAY, *AETOMYLUS MACULATUS* (GRAY), WITH A NOTE ON ITS BREEDING SEASON. *Indian J. Fish.* 29(1-2):253-255. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin 18, India]

84-000870 DeVries, R. and S. DeJager. THE GILL IN THE SPINY DOGFISH, *SQUALUS ACANTHIAS*: RESPIRATORY AND NONRESPIRATORY FUNCTION. *Am. J. Anat.* 169(1):1-29. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Amsterdam, Blvd. III, Kruislaan 320, 1098 SM Amsterdam, Netherlands]

84-000871 Dorairaj, K. and G. Nandakumar. OBSERVATIONS ON THE INDIAN SHORT-FINNED EEL *ANGUILLA BICOLOR BICOLOR* McCLELLAND CAUGHT FOR THE FIRST TIME AT SEA DURING SPAWNING MIGRATION. *Indian J. Fish.* 29(1-2):241-245. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin 682018, India]

84-000872 Duchac, B. J.; A. M. Nemella and E. M. Bühler. ELECTRON MICROSCOPICAL STUDIES OF GONADS IN PRIMARY AND SECONDARY MALES OF PROTOGYNOUS HERMAPHRODITIC FISH *CORIS JULIS* L. (LABRIDAE, TELEOSTEI). *Experientia (Basel)* 39(12):1376-1380. 15 Dec. 1983. SFA 29(2)
[Dep. Genet., Univ. Children's Hosp., Postfach, CH_4005 Basel, Switzerland]

84-000873 Dutta, H. M. and E. K. Chen. STRUCTURAL BASIS OF JAW PROTRUSION IN THE LARGEMOUTH BASS, *MICROPTERUS SALMOIDES*: A MICROSCOPIC ANALYSIS. *Can. J. Zool.* 61(6):1251-1264. June 1983. In English with French summ. SFA 29(2)
[Dep. Biol. Sci., Kent State Univ., Kent, OH 44242]

MORPHOLOGY (CONTINUED)

84-000874 Edge, T. A. and B. W. Coad. REDUCTION OF THE PELVIC SKELETON IN THE THREESPINE STICKLEBACK, *GASTEROSTEUS ACULEATUS*, IN TWO LAKES OF QUÉBEC. *Can. Field-Nat.* 97(3):334-336. July-Sept. 1983. SFA 29(2)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada]

84-000875 Emery, A. R. GEOGRAPHIC VARIATION IN THE INDO-PACIFIC DAMSELFISH GENUS *LEPIDOZYGUS* (PISCES: POMACENTRIDAE). *Can. J. Zool.* 61(6):1326-1338. June 1983. In English with French summ. SFA 29(2)
[Dep. Ichthyol. Herpetol., Royal Ontario Mus., 100 Queen's Park, Toronto, ON M5S 2C6, Canada]

84-000876 Fahy, W. E. THE MORPHOLOGICAL TIME OF FIXATION OF THE TOTAL NUMBER OF CAUDAL FIN RAYS IN *FUNDULUS MAJALIS* (WALBAUM). *J. Cons. Cons. Inst. Explor. Mer* 41(1):37-45. Oct. 1983. SFA 29(2)
[Inst. Mar. Sci., Univ. N.C., Morehead City 28557]

84-000877 Filipski, G. T. and M. V. H. Wilson. SUDAN BLACK B AS A NERVE STAIN FOR WHOLE CLEARED FISHES. *Copeia* 1984(1):204-208. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

84-000878 Fulop, G. M. I. and D. B. McMillan. PHAGOCYTOSIS IN THE SPLEEN OF THE SUNFISH *LEPOMIS* SPP. *J. Morphol.* 179(2):175-195. Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. West. Ont., London, ON N6A 5B7, Canada]

84-000879 Gayet, M. and F. J. Meunier. ÉCAILLES ACTUELLES ET FOSSILES D'OSTÉOGLOSSIFORMES (PISCES, TELEOSTEI). [RECENT AND FOSSIL OSTEOGLOSSIFORM (PISCES, TELEOSTEI) SCALES.] *C. R. Hebd. Seances Acad. Sci. Ser. III Ser. Vie* 279(12):539-542. 12 Dec. 1983. In French with English summ. SFA 29(2)
[Mus. Natl. Hist. Nat., 8 rue de Buffon, 75005 Paris, France]

84-000880 Govoni, J. J.; J. E. Olney; D. F. Markle and W. R. Curtsinger. OBSERVATIIONS ON STRUCTURE AND EVALUATION OF POSSIBLE FUNCTIONS OF THE VEXILLUM IN LARVAL CARAPIDAE (OPHIDIIFORMES). *Bull. Mar. Sci.* 34(1):60-70. Jan. 1984. SFA 29(2)
[NMFS, Beaufort Lab., Beaufort, NC 28516]

84-000881 Graham, J. B.; F. J. Koehrn and K. A. Dickson. DISTRIBUTION AND RELATIVE PROPORTIONS OF RED MUSCLE IN SCOMBRID FISHES: CONSEQUENCES OF BODY SIZE AND RELATIONSHIPS TO LOCOMOTION AND ENDOTHERMY. *Can. J. Zool.* 61(9):2087-2096. Sept. 1983. In English with French summ. SFA 29(2)
[Physiol. Res. Lab., Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

84-000882 Iwai, T. SURFACE MORPHOLOGY OF THE NAKED NEUROMASTS IN ANCHOVY LARVAE. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1935. Dec. 1983. SFA 29(2)
[Dep. Fish., Fac. Agric., Kyoto Univ., Kyoto 606, Japan]

MORPHOLOGY (CONTINUED)

84-000883 Jørgensen, N. and H. Schmalbruch. THE EGGS OF THE FRESHWATER FISH *EPIPLATYS DAGETI* HAVE TIGHT PLASMA MEMBRANES WITHOUT INTRAMEMBRANOUS PARTICLES. *Cell Tissue Res.* 235(3):643-646. Mar. 1984. SFA 29(2)
[Zoophysiol. Lab. B, August Krogh Inst., Universitetsparken 13, DK-2100 Copenhagen O, Denmark]

84-000884 Kawamura, G.; Y. Mukai and H. Ohta. [MORPHOLOGY OF THE EYE AND FREE NEUROMAST OF LARVAL AYU AND PALE CHUB AND ITS RELATION TO BEHAVIOUR IN WATER FLOW.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1527-1532. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Fac. Fish., Kagoshima Univ., 4-50-20 Shimoarata, Kagoshima 890, Japan]

84-000885 Kimmel, C. B.; D. C. Spray and M. V. L. Bennett. DEVELOPMENTAL UNCOUPLING BETWEEN BLASTODERM AND YOLK CELL IN THE EMBRYO OF THE TELEOST *FUNDULUS*. *Dev. Biol.* 102(2):483-487. Apr. 1984. SFA 29(2)
[Inst. Neurosci., Univ. Oreg., Eugene 97403]

84-000886 Lange, R. H. LES CRISTAUX DE LIPOVITELLINE-PHOSVITINE DANS L'OVOCYTE DE *LATIMERIA CHALUMNAE* SMITH, 1939 (COELACANTHIDAE, PISCES). ETUDE COMPARATIVE. [THE LIPOVITELLIN-PHOSVITIN CRYSTALS IN THE OOCYTE OF *LATIMERIA CHALUMNAE* SMITH, 1939 (COELACANTHIDAE, PISCES). COMPARATIVE INVESTIGATION.] *C. R. Hebd, Seances Acad. Sci. Ser. III Sci. Vie* 297(7):393-396. 24 Oct. 1983. In French with English summ. SFA 29(2)
[Inst. Anat. Cytobiol., Univ. Giessen, Aulweg 123, D-6300 Giessen, West Germany]

84-000887 Lanzing, W. J. R. MELANOGENESIS IN NORMAL AND PHENYLTHIOUREA-TREATED EGGS AND LARVAE OF *SAROTHERODON AUREUS*. *J. Fish Biol.* 24(3):273-280. Mar. 1984. SFA 29(2)
[Sch. Biol. Sci., Univ. Sydney, Australia]

84-000888 Leknes, I. L. ULTRASTRUCTURAL AND ULTRAHISTOCHEMICAL STUDIES ON VENTRICULAR ENDOCARDIAL CELLS IN TELEOSTS (PISCES). *J. Zool. (Lond.)* 201(4):507-513. Dec. 1983. SFA 29(2)
[Cell. Cardio. Res. Group, Inst. Anat., Univ. Bergen, Åstodveien 19, N-500 Bergen, Norway]

84-000889 Long, W. L. and N. A. Speck. DETERMINATION OF THE PLANE OF BILATERAL SYMMETRY IN THE TELEOST FISH, *ORYZIAS LATIPES*. *J. Exp. Zool.* 229(2):241-245. Feb. 1984. SFA 29(2)
[Biol. Dep., West. Md. Coll., Westminster 21157]

84-000890 Long, W. L. CELL MOVEMENTS IN TELEOST FISH DEVELOPMENT. *BioScience* 34(2):84-88. Feb. 1984. SFA 29(2)
[Dep. Biol., West. Md. Coll., Westminster, MD 21157]

84-000891 Loviah Joseph, G. RESPIRATORY SURFACE AREA (GILL AREA) OF THE HILLSTREAM FISH *GARRA MULLYA* (SYKES). *Indian J. Fish.* 27(1-2):172-176. 1980. SFA 29(2)
[Dep. Zool., Scott Christian Coll., Nagercoil, India]

MORPHOLOGY (CONTINUED)

84-000892 Lyons, J. OLFACTORY ORGAN MORPHOLOGY AND HISTOLOGY IN THE YELLOW PERCH AND GOLDEN SHINER. *Can. J. Zool.* 61(12):2987-2990. Dec. 1983. In English with French summ. SFA 29(2)
[Cent. Limnol., Univ. Wis., 680 North Park St., Madison 53706]

84-000893 Mayden, R. L. and E. O. Wiley. A METHOD OF PREPARING DISARTICULATED SKELETONS OF SMALL FISHES. *Copeia* 1984(1):230-232. 23 Feb. 1984. SFA 29(2)
[Div. Fish., Mus. Nat. Hist., Univ. Kans., Lawrence 66045]

84-000894 Mikhaylin, S. V. ON INTRASPECIFIC VARIATIONS OF THE PRINCIPAL MERISTIC CHARACTERS IN *DIPLOSOPINUS MULTISTRIATUS* (GEMPYLIDAE, PERCIFORMES). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):13-19. 1983. SFA 29(2)
[VNIRO, Moscow, USSR]

84-000895 Miyashita, Y.; T. Kumazawa and R. Fujii. RECEPTOR MECHANISMS IN FISH CHROMATOPHORES--VI. ADENOSINE RECEPTORS MEDIATE PIGMENT DISPERSION IN GUPPY AND CATFISH MELANOPHORES. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(2):205-210. 1984. SFA 29(2)
[R. Fujii: Dep. Biol., Fac. Sci., Toho Univ., Funabashi, Chiba 274, Japan]

84-000896 Motta, P. J. MECHANICS AND FUNCTIONS OF JAW PROTRUSION IN TELEOST FISHES: A REVIEW. *Copeia* 1984(1):1-18. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Mont., Missoula 59812]

84-000897 Muller, J. F. and R. E. Marc. THREE DISTINCT MORPHOLOGICAL CLASSES OF RECEPTORS IN FISH OLFACTORY ORGANS. *J. Comp. Neurol.* 222(4):482-495. 1 Feb. 1984. SFA 29(2)
[Univ. Tex. Grad. Sch. Biomed. Sci., Sens. Sci. Cent., Houston 77025]

84-000898 Nakamura, K. and M. Toyohiro. DISTRIBUTION PATTERNS OF URINARY TRACTS AND RENAL BLOOD VASCULAR SYSTEMS OF THE EEL *ANGUILLA JAPONICA*. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1803-1808. Dec. 1983. SFA 29(2)
[Fac. Fish., Kagoshima Univ., Kagoshima 890, Japan]

84-000899 Odiete, W. O. THE VISCERAL SENSORY LOBES IN THE MEDULLA OBLONGATA OF THE CATFISH, *CHRYSICHTHYS*. *Copeia* 1984(1):264-266. 23 Feb. 1984. SFA 29(2)
[Dep. Biol. Sci., Univ. Lagos, Akoka, Lagos, Nigeria]

84-000900 Oguri, M. DERMAL MELANOPHORES AND RENAL MELANIN-CONTAINING CELLS IN THE "COBALT" VARIANT OF RAINBOW TROUT. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1679-1681. Nov. 1983. SFA 29(2)
[Lab. Fish Biol., Fac. Agric., Nagoya Univ., Nagoya 464, Japan]

84-000901 Pica, A.; M. C. Grimaldi and F. Della Corte. THE CIRCULATING BLOOD CELLS OF TORPEDOS (*TORPEDO MARMORATA* RISSO AND *TORPEDO OCELLATA* RAFINESQUE). *Monit. Zool. Ital.* 17(4):353-374. 1983. SFA 29(2)
[Ist. Istol. Embriol., Fac. Sci., Univ. Napoli, Italy]

MORPHOLOGY (CONTINUED)

84-000902 Pinto, J. LABORATORY SPAWNING OF *AMMODYTES HEXAPTERUS* FROM THE PACIFIC COAST OF NORTH AMERICA WITH A DESCRIPTION OF ITS EGGS AND EARLY LARVAE. *Copeia* 1984(1):242-244. 23 Feb. 1984. SFA 29(2)
[Sch. Oceanogr., WB-10, Univ. Wash., Seattle 98195]

84-000903 Potthoff, T.; S. Kelley; M. Moe and F. Young. DESCRIPTION OF PORKFISH LARVAE (*ANISOTREMUS VIRGINICUS*, HAEMULIDAE) AND THEIR OSTEOLOGICAL DEVELOPMENT. *Bull. Mar. Sci.* 34(1):21-59. Jan. 1984. SFA 29(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149]

84-000904 Qiyong, Z. and C. Zeping. [POPULATION IDENTIFICATION OF RED-FIN PARGO, *PARARGYROPS EDITA* TANAKA, IN TAIWAN STRAIT AND BEIBU GULF.] *Oceanol. Limnol. Sin.* 14(6):511-521. 1983. SFA 29(2)
[Dep. Oceanol., Xianmen Univ., China]

84-000905 Reifel, C. W.; M. Marin-Sorensen and I. M. Samloff. GASTRIN IMMUNOREACTIVE CELLS IN THE GASTROINTESTINAL TRACTS FROM FOUR SPECIES OF FISH. *Can. J. Zool.* 61(7):1464-1468. July 1983. In English with French summ. SFA 29(2)
[Dep. Anat., Queen's Univ., Kingston, ON K7L 3N6, Canada]

84-000906 Ross, R. M. ANATOMICAL CHANGES ASSOCIATED WITH SEX REVERSAL IN THE FISH *THALASSOMA DUPERREY* (TELEOSTEI: LABRIDAE). *Copeia* 1984(1):245-248. 23 Feb. 1984. SFA 29(2)
[Biol. Dep., Thiel Coll., Greenville, PA 16125]

84-000907 Sivtseva, L. V. and D. A. Pavlov. XANTHOPHORE FORMATION IN EMBRYOS AND LARVAE OF ATLANTIC SALMON, *SALMON SALAR* (SALMONIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):148-153. 1983. SFA 29(2)
[Biol. Fac., Moscow State Univ., Moscow, USSR]

84-000908 Stuermer, C. A. O. and S. S. Easter, Jr. A COMPARISON OF THE NORMAL AND REGENERATED RETINOTECTAL PATHWAYS OF GOLDFISH. *J. Comp. Neurol.* 223(1):57-76. 10 Feb. 1984. SFA 29(2)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

84-000909 Tachibana, T.; K. Ishizeki; Y. Sakakura and T. Nawa. ULTRASTRUCTURAL EVIDENCE FOR A POSSIBLE SECRETORY FUNCTION OF MERKEL CELLS IN THE BARBELS OF A TELEOST FISH, *CYPRINUS CARPIO*. *Cell Tissue Res.* 235(3):695-697. Mar. 1984. SFA 29(2)
[Dep. Oral Anat., Sch. Dent., Iwate Med. Univ., Morioka 020, Japan]

84-000910 Teshima, K. and M. Hara. EPITHELIAL CELLS OF THE INTESTINE OF THE FRESHWATER STINGRAY *POTAMOTRYGON MAGDALENAE* TAKEN FROM THE MAGDALENA RIVER, COLOMBIA, SOUTH AMERICA. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1665-1668. Nov. 1983. SFA 29(2)
[Far Seas Fish. Res. Lab., 7-1, Orido 5, Shimizu 424, Japan]

MORPHOLOGY (CONTINUED)

84-000911 Toyoshima, K.; O. Nada and A. Shimamura. FINE STRUCTURE OF MONOAMINE-CONTAINING BASAL CELLS IN THE TASTE BUDS ON THE BARBELS OF THREE SPECIES OF TELEOSTS. *Cell Tissue Res.* 235(3):479-484. Mar. 1984. SFA 29(2)
[Dep. Oral Anat., Kyushu Dent. Coll., Kokurakita-ku, Kitakyushu, Japan]

84-000912 Travers, R. A. A REVIEW OF THE MASTACEMBELOIDEI, A SUBORDER OF SYNBRANCHIFORM TELEOST FISHES. PART I: ANATOMICAL DESCRIPTIONS. *Bull. Br. Mus. (Nat. Hist.) Zool. Ser.* 46(1):1-133. 26 Jan. 1984. SFA 29(2)
[Dep. Zool. Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

84-000913 Tsujii, T.; I. Naito; S. Ukita; T. Ono and S. Seno. THE ANIONIC BARRIER SYSTEM IN THE MESONEPHRIC RENAL GLOMERULUS OF THE ARCTIC LAMPREY, *ENTOSPHENUS JAPONICUS* (MARTENS) (CYCLOSTOMATA). *Cell Tissue Res.* 235(3):491-496. Mar. 1984. SFA 29(2)
[Div. Ultrastructural Res., Shigei Med. Res. Inst., 2117 Yamada, Okayama 701-02, Japan]

84-000914 Venkata Subba Rao, K. STUDIES ON THE POPULATIONS OF *SAURIDA TUMBIL* (BLOCH) FROM INDIAN WATERS. *Indian J. Fish.* 29(1-2):8-19. 1982. SFA 29(2)
[Natl. Acad. Agric. Res. Manage., Rajendranagar, Hyderabad-500030, India]

84-000915 Zapata, A.; R. Fänge; A. Mattisson and A. Villena. PLASMA CELLS IN ADULT ATLANTIC HAGFISH, *MYXINE GLUTINOSA*. *Cell Tissue Res.* 235(3):691-693. Mar. 1984. SFA 29(2)
[Dep. Morfol. Micros., Fac. Biol., Univ. León, León, Spain]

PHYSIOLOGY

84-000916 Abe, H. DISTRIBUTION OF FREE L-HISTIDINE AND ITS RELATED COMPOUNDS IN MARINE FISHES. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1683-1687. Nov. 1983. SFA 29(2)
[Lab. Chem., Fac. Home Econ., Kyoritsu Women's Univ., Molohachioji, Hachioji, Tokyo 193, Japan]

84-000917 Al-Tai, W. F. ; M. G. Jones and M. T. Wilson. THE PHOSPHOLIPIDS ASSOCIATED WITH CYTOCHROME c OXIDASE ISOLATED FROM BEEF, DOGFISH AND COD HEART. *Comp. Biochem. Physiol. B Comp. Bichem.* 77(3):609-616. 1984. SFA 29(2)
[M.T. Wilson: Dep. Chem., Univ. Essex, Wivenhoe Park, Colchester CO4 3SQ, U.K.]

84-000918 Asakawa, M. STRUCTURE OF DISACCHARIDE FROM EEL SKIN MUCOUS GLYCOPROTEIN AND ITS LINKAGE TO PROTEIN MOIETY. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1601-1606. Oct. 1983. SFA 29(2)
[Lab. Food Sci., Fac. Educ., Kumamoto Univ., Kumamoto 860, Japan]

84-000919 Büyükhatipoglu, S. and W. Holtz. SPERM OUTPUT IN RAINBOW TROUT (*SALMO GAIRDNERI*)-EFFECT OF AGE, TIMING AND FREQUENCY OF STRIPPING AND PRESENCE OF FEMALES. *Aquaculture* 37(1):63-71. 15 Feb.

PHYSIOLOGY (CONTINUED)

84-000919 CONTINUED 1984. SFA 29(2)
[Inst. Tierzucht Haustiergenet., Univ. Göttingen, Albrecht-Thaerweg 1, 3400 Göttingen, West Germany]

84-000920 Barbour, S. E. and E. T. Garside. SOME PHYSIOLOGIC DISTINCTIONS BETWEEN FRESHWATER AND DIADROMOUS FORMS OF THE ATLANTIC SALMON, *SALMO SALAR* L. *Can. J. Zool.* 61(5):1165-1170. May 1983. In English with French summ. SFA 29(2)
[Dep. For. Nat. Resour., Univ. Edinburgh, King's Bldg., Mayfield Rd., Edinburgh EH9 3JU, Scotland]

84-000921 Begum, K. A.; H. N. Behera and B. K. Patnaik. THYROID HORMONES AND CARBOHYDRATE METABOLISM OF BRAIN IN THE TELEOST, *CHANNA PUNCTATUS*. I. EFFECT OF T_4 AND THIOUREA ON SUCCINIC DEHYDROGENASE (SDH) ACTIVITY AND PROTEIN CONTENT. *Gen. Comp. Endocrinol.* 53(3):402-409. Mar. 1984. 1984. SFA 29(2)

84-000922 Benfey, T. J. and A. M. Sutterlin. THE HAEMATOLOGY OF TRIPLOID LANDLOCKED ATLANTIC SALMON, *SALMO SALAR* L. *J. Fish Biol.* 24(3):333-338. Mar. 1984. SFA 29(2)
[Dep. Fish. Oceans, 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada]

84-000923 Bezrukov, V. F. and G. D. Berdyshev. VARIABILITY IN THE MUSCLE PROTEINS OF WHITE AMUR, *CTENOPHARYNGODON IDELLA*, SILVER CARP, *HYPOPHTHALMICHTHYS MOLITRIX*, AND BIGHEAD, *ARISTICHTHYS NOBILIS* (CYPRINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):134-139. 1983. SFA 29(2)
[Kiev State Univ., Kiev, USSR]

84-000924 Blum, P. and C. A. Luer. SEXUAL MATURATION IN THE CLEARNOSE SKATE, *RAJA EGLANTERIA*. *Fla. Sci.* 47(Suppl. 1):19. Mar. 1984. Abstract only. SFA 29(2)
[Mote Mar. Lab., 1600 City Island Park, Sarasota, FL 33577] The clearnose skate, *Raja eglanteria*, inhabits nearshore waters of the central Gulf coast of Florida during winter and spring, at which time mating and egg deposition take place. Since only mature animals come inshore to breed, information on sexual maturation is unavailable in the literature. Using offspring from laboratory bred skates, sexual development has been observed over the past two years with animals of known age. Males are recognized by the presence of claspers, which are identifiable even during embryogenesis, and remain small during the first year. The largest males can attain adult size claspers in as little as 1-1/2 years and have been shown to possess mature sperm. Females can reach adult body size within two years but do not possess mature ova or well-developed shell glands.

84-000925 Bogomolnaya, A. and Z. Yaron. STIMULATION *IN VITRO* OF ESTRADIOL SECRETION BY THE OVARY OF A CICHLID FISH, *SAROTHERODON AUREUS*. *Gen. Comp. Endocrinol.* 53(2):187-196. Feb. 1984. SFA 29(2)
[Dep. Zool., George S. Wise Fac. Life Sci., Tel Aviv Univ., Tel Aviv 69978, Israel]

PHYSIOLOGY (CONTINUED)

84-000926 Bourne, P. K. and A. R. Cossins. SODIUM AND POTASSIUM TRANSPORT IN TROUT (*SALMO GAIRDNERI*) ERYTHROCYTES. *J. Physiol. (Lond.)* 347:361-375. Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Liverpool, P.O. Box 147, Liverpool L69 3BX, England]

84-000927 Brauer, R. W.; V. G. Sidelyova; M. B. Dail; G. I. Galazii and R. D. Roer. PHYSIOLOGICAL ADAPTATION OF COTTOID FISHES OF LAKE BAIKAL TO ABYSSAL DEPTHS. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):699-705. 1984. SFA 29(2)
[Inst. Mar. Biochem. Res., Univ. N.C., 7205 Wrightsville Ave., Wilmington 28403] Pressure tolerance of ten species of shallow water (<100m) Cottidae and deep water (300-1600m) Abyssocottidae, cottoid fishes endemic to Lake Baikal, were explored by measuring threshold pressures for high pressure convulsions. The observed family differences reflect not merely acclimation to habitat pressure, but rather suggest a significant degree of genetic determinacy of this characteristic, pointing to a possible role of hydrostatic pressure as a selection factor in the evolution of deep water faunas.

84-000928 Broberg, S. and R. Kristoffersson. OXYGEN CONSUMPTION AND LACTATE ACCUMULATION IN THE INTRA-OVARIAN EMBRYOS AND YOUNG OF THE VIVIPAROUS FISH, *ZOARCES VIVIPARUS* (L.) IN RELATION TO DECREASING WATER O_2 CONCENTRATION. *Ann. Zool. Fenn.* 20(4):301-306. 1983. SFA 29(2)
[Tvärminne Zool. Stn., SF-10850 Tvärminne, Finland]

84-000929 Brodeur, R. D. GASTRIC EVACUATION RATES FOR TWO FOODS IN THE BLACK ROCKFISH, *SEBASTES MELANOPS* GIRARD. *J. Fish Biol.* 24(3):287-298. Mar. 1984. SFA 29(2)
[Sch. Oceanogr., Oreg. State Univ., Mar. Sci. Cent., Newport 97365] The rates of gastric evacuation of two food types, squid and fish, were measured in the laboratory for adult black rockfish, *Sebastes melanops*, held nominally at 11°C. Linear, logarithmic and square root regression models were applied to analyse the data expressed as both wet and dry weight proportions of the original meal. The linear model provided the best fit for the wet weight relationship of squid. The dry weight of squid and both the wet and dry weight of fish were best described by a logarithmic model, or by a square root model when the regressions were 'forced' through the original meal size. The instantaneous evacuation rates ($\approx 6\%\ h^{-1}$) and times to complete evacuation ($\approx$76h) were similar for all relations except those involving the wet weight of squid. The addition of the meal size as an independent variable improved the models in most cases whereas the addition of the weight of fish used in the experiments did not improve the model in any instance.

84-000930 Brown, J. A. G.; A. Jones and A. J. Matty. OXYGEN METABOLISM OF FARMED TURBOT (*SCOPHTHALMUS MAXIMUS*). I. THE INFLUENCE OF FISH SIZE AND WATER TEMPERATURE ON METABOLIC RATE. *Aquaculture* 36(3):273-281. 15 Jan. 1984. SFA 29(2)
[157 Great Cullings, Rush Green, Romford, Essex, England] The use of fish farm production and fry tanks as large-scale respirometers proved very effective. The high stocking densities maintained in the tanks, resulted in a rapid decline in dissolved oxygen saturation after water and oxygen supplies were interrupted. The measurement of this decline together with fish biomass and number, water temperature, salinity and atmospheric pressure enabled the oxygen consumption rate of the fish to be calculated as a function of body weight. Fish size on the farm ranged from 4 to 1000 g and

PHYSIOLOGY (CONTINUED)

84-000930 CONTINUED over a period of 2 years, oxygen consumption determinations were made at temperatures ranging from 7 to 16°C. The relationship between oxygen consumption rate and mean weight of the fish was fitted statistically into five temperature groups of 2°C spread, i.e. 7-8°C, 9-10°C, 11-12°C, 13-14°C, 15-16°C. The relationship between oxygen consumption rate, fish size and temperature was similar to that of salmonids, although the rates of oxygen consumption were only about one half.

84-000931 Brown, M. M.; P. B. Sardenga; G. A. Olson; S. W. Delatte and R. D. Olson. MIF-1 (PRO-LEU-GLY-NH_2) DECREASES ACTIVITY IN SIAMESE FIGHTING FISH (*BETTA SPLENDENS*). *Pharmacol. Biochem. Behav.* 20(4):629-630. Apr. 1984. SFA 29(2)
[Dep. Psychol., Univ. New Orleans, New Orleans, LA 70148]

84-000932 Burton, M. P. and D. R. Idler. CAN NEWFOUNDLAND LANDLOCKED SALMON, *SALMO SALAR* L., ADAPT TO SEA WATER? *J. Fish Biol.* 24(1):59-64. Jan. 1984. SFA 29(2)
[Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's NF A1C 5S7, Canada] Landlocked salmon derived from a wild population of stunted ouananiche and bred in the laboratory showed signs of smoltification, but adaptation to sea water was slow and limited to 11% of the fish tested. Sea water survival was not related to initial size, within the range used, nor to sex, age (2+ years v. 3+ years) or spawning history. Freshwater ouananiche had fewer gill chloride cells than anadromous smolts of similar size in fresh water. Anadromous smolts showed an increase in chloride cells after adaptation to sea water and those ouananiche which successfully adapted to sea water had a greatly increased number of gill chloride cells.

84-000933 Chiasson, A. G. and J. H. Gee. SWIM BLADDER GAS COMPOSITION AND CONTROL OF BUOYANCY BY FATHEAD MINNOWS (*PIMEPHALES PROMELAS*) DURING EXPOSURE TO HYPOXIA. *Can. J. Zool.* 61(10):2213-2218. Oct. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-000934 Chingjiang, W. and J. H. Schröder. THE TISSUE-SPECIFIC PATTERNS OF LACTATE DEHYDROGENASE (LDH), ALCOHOL DEHYDROGENASE (ADH), AND G-6-PHOSPHATE DEHYDROGENASE (G-6-PD) IN ADULTS AND THEIR OCCURRENCE DURING ONTOGENY OF THE GUPPY, *POECILIA RETICULATA* PETERS (PISCES: POECILIIDAE). *J. Exp. Zool.* 229(2):259-264. Feb. 1984. SFA 29(2)
[Inst. Hydrobiol., Acad. Sin., Wukan, China]

84-000935 Chudzik, J. and A. H. Houston. TEMPERATURE AND ERYTHROPOIESIS IN GOLDFISH. *Can. J. Zool.* 61(6):1322-1325. June 1983. SFA 29(2)
[A. H. Houston: Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada]

84-000936 Claiborne, J. B. and N. Heisler. ACID-BASE REGULATION AND ION TRANSFERS IN THE CARP (*CYPRINUS CARPIO*) DURING AND AFTER EXPOSURE TO ENVIRONMENTAL HYPERCAPNIA. *J. Exp. Biol.* 108:25-43. Jan. 1984. SFA 29(2)
[Dep. Biol., Ga. South. Coll., Statesboro 30460]

PHYSIOLOGY (CONTINUED)

84-000937 Cook, A. F. and R. E. Peter. THE EFFECTS OF SOMATOSTATIN ON SERUM GROWTH HORMONE LEVELS IN THE GOLDFISH, *CARASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 54(1):109-113. Apr. 1984. SFA 29(2)
[Zool. Dep., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

84-000938 Cowey, C. B.; K. L. Wee and A. G. J. Tacon. EFFECT OF FATTY ACID INTAKE ON GROWTH AND FATTY ACID COMPOSTION OF LIVER AND MUSCLE OF SNAKEHEAD. *Bull. Jpn. Soc. Sci. Fish.* 49(1):1573-1577. Oct. 1983. SFA 29(2)
[Inst. Mar. Biochem., St. Fitticks Rd., Aberdeen, Scotland]

84-000939 Dabrowska, H. EFFECT OF DIETARY PROTEINS ON THE FREE AMINO ACID CONTENT IN RAINBOW TROUT (*SALMO GAIRDNERI* RICH.) MUSCLES. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):553-556. 1984. SFA 29(2)
[Inst. Ichthyobiol. Fish., Acad. Agric. Technol., 10-957 Olsztyn-Kortowo, Poland]

84-000940 Danulat, E. and H. Kausch. CHITINASE ACTIVITY IN THE DIGESTIVE TRACT OF THE COD, *GADUS MORHUA* (L.). *J. Fish Biol.* 24(2):125-133. Feb. 1984. SFA 29(2)
[Inst. Hydrobiol. Fischereiwiss., Zeiseweg 9, 2000 Hamburg 50, West Germany]

84-000941 Darling, J. D. S.; M. L. Noble and E. Shaw. REPRODUCTIVE STRATEGIES IN THE SURFPERCHES. I. MULTIPLE INSEMINATION IN NATURAL POPULATIONS OF THE SHINER PERCH, *CYMATOGASTER AGGREGATA*. *Evolution* 34(2):271-277. Mar. 1980. SFA 29(2)
[Dep. Biol. Sci., Stanford Univ., Stanford, CA 94305]

84-000942 Davis, T. L. O. A POPULATION OF SEXUALLY PRECOCIOUS BARRAMUNDI, *LATES CALCARIFER*, IN THE GULF OF CARPENTARIA, AUSTRALIA. *Copeia* 1984(1):144-149. 23 Feb. 1984. SFA 29(2)
[Div. Fish. Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, NSW 2230, Australia]

84-000943 DeVlaming, V.; R. Fitzgerald; G. Delahunty; J. J. Cech, Jr.; K. Selman and M. Barkley. DYNAMICS OF OOCYTE DEVELOPMENT AND RELATED CHANGES IN SERUM ESTRADIOL-17β, YOLK PRECURSOR, AND LIPID LEVELS IN THE TELEOSTEAN FISH, *LEPTOCOTTUS ARMATUS*. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):599-610. 1984. SFA 29(2)
[Dep. Anim. Physiol., Univ. Calif., Davis 95616]

84-000944 Diana, J. S. AN ENERGY BUDGET FOR NORTHERN PIKE (*ESOX LUCIUS*). *Can. J. Zool.* 61(9):1968-1975. Sept. 1983. In English with French summ. SFA 29(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Allocation of energy by northern pike (*Esox lucius*) to maintenance, growth, and reproduction was estimated by a combination of laboratory and field techniques. Parameters were fitted to a bionenergetics model to determine the energy budgets of pike from Lac Ste Anne, Alberta. A poor fit was obtained when comparing the predicted ration and growth (from the model) to the estimated

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84-000944 CONTINUED ration and growth (in the field), indicating that estimates for some budget components were in error. Further examination indicated that field ration data were probably inaccurate, and budgets were then calculated avoiding these data. The relative cost of maintenance was very low for age 0 fish (~60%) and increased with age. Relative allocations to reproduction and growth were similar from ages 1 to 3, although the relative energy allocated to growth declined from age 0 to 1. There were differences between energy budgets of males and females; females ingested 1.1-to 1.3-fold more energy annually than did males, and this extra energy was diverted into ovary growth, since total body growth was similar in the two sexes. There were also large differences in the seasonal timing of body and gonad growth between the sexes. Males increased in body energy over the summer and winter, while all testicular growth occurred in August. Females increased in body energy over summer only, while ovarian growth occurred mainly during the winter. Both sexes declined in energy stores over the spawning interval (March to May).

84-000945 Diana, J. S. OXYGEN CONSUMPTION BY LARGEMOUTH BASS UNDER CONSTANT AND FLUCTUATING THERMAL REGIMES. *Can. J. Zool.* 61(8):1892-1895. Aug. 1983. In English with French summ. SFA 29(2)
[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109]

84-000946 DiMichele, L. and D. A. Powers. THE RELATIONSHIP BETWEEN OXYGEN CONSUMPTION RATE AND HATCHING IN *FUNDULUS HETEROCLITUS*. *Physiol. Zool.* 57(1):46-51. Jan.-Feb. 1984. SFA 29(2)
[Dep. Biol., Johns Hopkins Univ., Baltimore, MD 21218]

84-000947 DiMichele, L. and D. A. Powers. DEVELOPMENTAL AND OXYGEN CONSUMPTION RATE DIFFERENCES BETWEEN LACTATE DEHYDROGENASE-B GENOTYPES OF *FUNDULUS HETEROCLITUS* AND THEIR EFFECT ON HATCHING TIME. *Physiol. Zool.* 57(1):52-56. Jan.-Feb. 1984. SFA 29(2)
[Dep. Biol., Johns Hopkins Univ., Baltimore, MD 21218]

84-000948 Dorairaj, K.; D. Kandasami and R. Soundararajan. ON INDUCED MATURATION IN THE INDIAN SHORT-FINNED EEL *ANGUILLA BICOLOR BICOLOR* McCLELLAND. *Indian J. Fish.* 28(1-2):233-239. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Mandapam Camp, India]

84-000949 Fauconneau, B. and P. Saglio. PROTEIN-BOUND AND FREE AMINO ACID CONTENT IN THE SKIN MUCUS OF THE EUROPEAN EEL, *ANGUILLA ANGUILLA* (L.). *Comp. Biochem. Physiol. B Comp. Biochem.* 77(3):513-516. 1984. SFA 29(2)
[Cent. Rech. Hydrobiol., I.N.R.A.-B.P. 3, St. Pée sur Nivelle, 64310 Ascain, France]

84-000950 Ferraris, R. P. and G. A. Ahearn. SUGAR AND AMINO ACID TRANSPORT IN FISH INTESTINE. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):397-413. 1984. SFA 29(2)
[G.A. Ahearn: Dep. Zool., 2538 The Mall, Univ. Hawaii, Honolulu 96822]

84-000951 Flood, C. G. and J. G. Eales. EFFECTS OF STARVATION AND REFEEDING ON PLASMA T_4 AND T_3 LEVELS AND T_4 DEIODINATION IN RAINBOW TROUT, *SALMO GAIRDNERI*. *Can. J. Zool.*

PHYSIOLOGY (CONTINUED)

84-000951 CONTINUED 61(9):1949-1953. Sept. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-000952 Fluck, R. A.; C. E. Killian; K. Miller; J. N. Dalpe and T. M. Shih. CONTRACTION OF AN EMBRYONIC EPITHELIUM, THE ENVELOPING LAYER OF THE MEDAKA (*ORYZIAS LATIPES*), A TELEOST. *J. Exp. Zool.* 229(1):127-142. Jan. 1984. SFA 29(2)
[Dep. Biol., Franklin and Marshall Coll., Lancaster, PA 17604]

84-000953 Fok, P. and J. G. Eales. REGULATION OF PLASMA T_3 LEVELS IN T_4-CHALLENGED RAINBOW TROUT, *SALMO GAIRDNERI*. *Gen. Comp. Endocrinol.* 53(2):197-202. Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-000954 Frick, L. ISOLATION AND CHARACTERIZATION OF FIVE CYTOSOLIC DI-AND TRIPEPTIDASES FROM THE SKIPJACK TUNA (*KATSUWONIS PELAMIS*) *Comp. Biochem. Physiol. B Comp. Biochem* 77(3):533-540. 1984. SFA 29(2)
[Dep. Biochem. Nutr. 231H, Univ. N.C., Chapel Hill 27514]

84-000955 Fukayama, S. and H. Takahaski. SEX DIFFERENTIATION AND DEVELOPMENT OF THE GONAD IN THE SAND LAMPREY, *LAMPETRA REISSNERI*. *Bull. Fac. Fish. Hokkaido Univ.* 34(4):279-290. Dec. 1983. SFA 29(2)
[Lab. Fresh-Water Fish-Cult., Fac. Fish., Hokkaido Univ., Japan]

84-000956 Furspan, P.; H. D. Prange and L. Greenwald. ENERGETICS AND OSMOREGULATION IN THE CATFISH, *ICTALURUS NEBULOSUS* AND *I. PUNCTATUS*. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):773-778. 1984. SFA 29(2)
[Dep. Physiol., Univ. Mich., Ann Arbor 48104]

84-000957 Gern, W. A.; E. Wechsler and D. Duvall. CHARACTERISTICS AND NON-RHYTHMICITY OF RETINAL HYDROXYINDOLE-O-METHYLTRANSFERASE ACTIVITY IN TROUT *(SALMO GAIRDNERI)*. *Gen. Comp. Endocrinol.* 53(2):169-178. Feb. 1984. SFA 29(2)
[Dep. Zool. Physiol., Uñiv. Wyo., Laramie 82071]

84-000958 Goetz, F. W. and T. Hennessy. THE *IN VITRO* EFFECTS OF PHOSPHODIESTERASE INHIBITORS ON 17α20β-DIHYDROXY-4-PREGNEN-3-ONE INDUCED GERMINAL VESICLE BREAKDOWN IN BROOK TROUT (*SALVELINUS FONTINALIS*) OOCYTES. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):785-786. 1984. SFA 29(2)
[Dep. Biol., Univ. Notre Dame, Notre Dame, IN 46556]

84-000959 Graham, J. B. and T. A. Baird. THE TRANSITION TO AIR BREATING IN FISHES. III. EFFECTS OF BODY SIZE AND AQUATIC HYPOXIA ON THE AERIAL GAS EXCHANGE OF THE SWAMP EEL *SYNBRANCHUS MARMORATUS*. *J. Exp. Biol.* 108:357-375. Jan. 1984. SFA 29(2)
[Physiol. Res. Lab., Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

PHYSIOLOGY (CONTINUED)

84-000960 Gray, J. INTERACTION OF SOUND PRESSURE AND PARTICLE ACCELERATION IN THE EXCITATION OF THE LATERAL-LINE NEUROMASTS OF SPRATS. *Proc. R. Soc. Lond. B Biol. Sci.* 220(1220):299-325. 23 Jan. 1984. SFA 29(2)
[Mar. Biol. Assoc., The Laboratory, Citadel Hill, Plymouth PL1 2PB England]

84-000961 Hanson, M.; L. Karlsson and H. Westerberg. MAGNETIC MATERIAL IN EUROPEAN EEL *(ANGUILLA ANGUILLA* L.). *Comp. Biochem. Physiol. A Comp. Physiol.* 77(2):221-224. 1984. SFA 29(2)
[Phys. Dep., Chalmers Univ. Technol., S-412 96 Gothenberg, Sweden]

84-000962 Heiligenberg, W. ZENTRALNERVÖSE INFORMATIONSVERARBEITUNG BEI ELEKTRISCHEN FISCHEN. [INFORMATION PROCESSING IN THE CENTRAL NERVOUS SYSTEM OF ELECTRIC FISH.] *Verh. Dtsch. Zool. Ges.* 76. p. 17-23. 1983. In German with English summ. SFA 29(2)
[Scripps Inst. Oceanogr., Univ. Calif., A 002, La Jolla 92093]

84-000963 Henry, J. A. C. and A. H. Houston. ABSENCE OF RESPIRATORY ACCLIMATION TO DIURNALLY-CYCLING TEMPERATURE CONDITIONS IN RAINBOW TROUT. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):727-734. 1984. SFA 29(2)
[Dep. Biol. Sci., Brock Univ., St. Catharines, ON L2S 3A1, Canada]

84-000964 Higson, F. K. and O. T. G. Jones. THE GENERATION OF ACTIVE OXYGEN SPECIES BY STIMULATED RAINBOW TROUT LEUCOCYTES IN WHOLE BLOOD. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(3):583-587. 1984. SFA 29(2)
[Dep. Biochem., Med. Sch., Univ. Bristol, Bristol BS8 1TD, U.K.]

84-000965 Hille, S. THE EFFECT OF ENVIRONMENTAL AND ENDOGENOUS FACTORS ON BLOOD CONSTITUENTS OF RAINBOW TROUT (*SALMO GAIRDNERI*)--I. FOOD CONTENT OF STOMACH AND INTESTINE. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(2):311-314. 1984. SFA 29(2)
[Sickingenstr. 52, D 78 Freiburg, West Germany]

84-000966 Hobe, H.; P. R. H. Wilkes; R. L. Walker; C. M. Wood and B. R. McMahon. ACID-BASE BALANCE, IONIC STATUS, AND RENAL FUNCTION IN RESTING AND ACID-EXPOSED WHITE SUCKERS (*CATOSTOMUS COMMERSONI*). *Can. J. Zool.* 61(12):2660-2668. Dec. 1983. In English with French summ. SFA 29(2)
[Dep. Biol., Univ. Calgary, Calgary, AB T2N 1N4, Canada]

84-000967 Hoffmann, R. and R. Lommel. EFFECTS OF REPEATED BLOOD SAMPLING ON SOME BLOOD PARAMETERS IN FRESHWATER FISH. *J. Fish Biol.* 24(3):245-251. Mar. 1984. SFA 29(2)
[Inst. Zool. Hydrobiol., Univ. Munich, D 8000 Munich 22, Kaulbochstr. 37, West Germany]

84-000968 Ikeda, Y. and A. Fujikata. [INFLUENCE OF HEMOLYSIS ON SERUM CONSTITUENT LEVELS IN CARP.] *Bull. Jpn. Soc. Sci. Fish.* 49(11):1761. Nov. 1983. In Japanese. SFA 29(2)
[Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

PHYSIOLOGY (CONTINUED)

84-000969 Ingermann, R. L.; R. C. Terwilliger and M. S. Roberts. FOETAL AND ADULT BLOOD OXYGEN AFFINITIES OF THE VIVIPAROUS SEAPERCH, *EMBIOTOCA LATERALIS*. *J. Exp. Biol.* 108:453-457. Jan. 1984. SFA 29(2)
[Obstet. Gynecol. Res. L458, Oreg. Health Sci. Univ., Portland 97201]

84-000970 Ishida, A. T.; A. Kaneko and M. Tachibana. RESPONSES OF SOLITARY RETINAL HORIZONTAL CELLS FROM *CARASSIUS AURATUS* TO L-GLUTAMATE AND RELATED AMINO ACIDS. *J. Physiol. (Lond.)* 348:255-270. Mar. 1984. SFA 29(2)
[A. Kaneko: Dep. Inf. Physiol., Natl. Inst. Physiol. Sci., Okazaki 444, Japan]

84-000971 Ishioka, H. [ISOLATED FIN MUSCLES OF RED SEA BREAMS FOR THE *IN VITRO* METABOLIC STUDIES.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1523-1526. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Nansei Reg. Fish. Res. Lab., Ohno-cho, Saikigun, Hiroshima 739-04, Japan]

84-000972 Ishizeki, K.; T. Nawa; T. Tachibana; Y. Sakakura and S. Iida. HEMOPOIETIC SITES AND DEVELOPMENT OF EOSINOPHIL GRANULOCYTES IN THE LOACH, *MISGURNUS ANGUILLICAUDATUS*. *Cell Tissue Res.* 235(2):419-426. Feb. 1984. SFA 29(2)
[Dep. Oral Anat., Sch. Dent., Iwate Med. Univ., 020, Morioka, Iwate, Japan]

84-000973 Itano, K. and K. Sasaki. [BINDING OF MERCURY COMPOUNDS TO PROTEIN COMPONENTS OF FISH MUSCLE.] *Bull. Jpn. Soc. Sci. Fish.* 49(12):1849-1853. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Osaka City Inst. Publ. Health Environ. Sci., 8-34, Tokyo, Tennoji, Osaka 543, Japan]

84-000974 Iwata, K. and I. Kakuta. A COMPARISON OF CATALYTIC PROPERTIES OF GLUTAMATE DEHYDROGENASE FROM LIVER AND MUSCLE BETWEEN AMPHIBIOUS *PERIOPHTHALMUS CANTONENSIS* AND WATER-BREATHING GOBID FISHES *TRIDENTIGER OBSCURUS OBSCURUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1903-1908. Dec. 1983. SFA 29(2)
[Fac. Educ., Wakayama Univ., Wakayama 640, Japan]

84-000975 Jana, B. B. and G. P. Paul. CALORIFIC VALUES AS FUNCTIONS OF MAIN BODY CONSTITUENTS IN SOME FRESHWATER TELEOSTS. *Indian J. Fish.* 27(1-2):269-272. 1980. SFA 29(2)
[Dep. Zool., Univ. Kalyani, Kalyani-741235, West Bengal, India]

84-000976 Johnston, I. A. and L. M. Bernard. QUANTITATIVE STUDY OF CAPILLARY SUPPLY TO THE SKELETAL MUSCLES OF CRUCIAN CARP *CARASSIUS CARASSIUS* L.: EFFECTS OF HYPOXIC ACCLIMATION. *Physiol. Zool.* 57(1):9-18. Jan.-Feb. 1984. SFA 29(2)
[Dep. Physiol. Pharmacol., Univ. Saint Andrews, Saint Andrews, KY16 9TS, Fife, Scotland]

84-000977 Johnstone, R. and A. F. Youngson. THE PROGENY OF SEX-INVERTED FEMALE ATLANTIC SALMON (*SALMO SALAR* L.). *Aquaculture* 37(2):179-182. 1 Mar. 1984. SFA 29(2)

PHYSIOLOGY (CONTINUED)

84-000977 CONTINUED
[DAFS Mar. Lab., Victoria Rd., Torry, Aberdeen, Scotland] A group of Atlantic salmon juveniles received dietary 17α-methyl-testosterone (3 mg/kg of food) for 60 days after first-feeding. Many of these fish became sexually mature as males at 1.5 years of age, while they remained in freshwater. Supposed sex-inverted females among these were identified by their failure to strip manually. Milt from the excised gonads of five of these fish were used separately to fertilise mixed ova from normal adult females. The progeny of each male, when examined 8 weeks after first-feeding, all had typically female gonads (n = 50).

84-000978 Kader, A.; D. Zafar and A. L. Bhuiyan. SURVIVAL OF YOUNG *TILAPIA MOSSAMBICA* PETERS AT DIFFERENT SALINITIES. *Indian J. Fish.* 28(1-2):269-272. 1981. SFA 29(2)
[Dep. Mar. Biol., Univ. Chittagong, Chittagong, Bangladesh] Results of the studies on the survival of acclimatized and non-acclimatized young *Tilapia mossambica* Peters in increasing grades of a salinities, from 5ppt to 40ppt, are presented. While the survival rate was same for both high in lower salinities, acclimatized fish showed better survival rate in higher salinities.

84-000979 Kagawa, H.; G. Young and Y. Nagahama. *IN VITRO* ESTRADIOL-17β AND TESTOSTERONE PRODUCTION BY OVARIAN FOLLICLES OF THE GOLDFISH, *CARASSIUS AURATUS*. *Gen. Comp. Endocrinol.* 54(1):139-143. Apr. 1984. SFA 29(2)
[Dep. Anat., Univ. Occupational Environ. Health, Sch. Med., Yahata-Nishiku, Kitakyushu 807, Japan]

84-000980 Kagawa, H.; G. Young and Y. Nagahama. CHANGES IN PLASMA STEROID HORMONE LEVELS DURING GONADAL MATURATION IN FEMALE GOLDFISH *CARASSIUS AURATUS*. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1783-1787. Dec. 1983. SFA 29(2)
[Dep. Anat., Univ. Occupational Environ. Health, Sch. Med., Yahata-Nishiku, Kitakyushu 807, Japan]

84-000981 Kaushik, S. J. and P. Luquet. RELATIONSHIP BETWEEN PROTEIN INTAKE AND VOLUNTARY ENERGY INTAKE AS AFFECTED BY BODY WEIGHT WITH AN ESTIMATION OF MAINTENANCE NEEDS IN RAINBOW TROUT. *J. Anim. Physiol. Anim. Nutr.* 51(1-2):57-69. Feb. 1984. SFA 29(2)
[Lab. Nutr. Elevage Poissons, INRA, Cent. Rech. Hydrobiol., BP3 Saint Pée-sur-Nivelle, 64310 Ascain, France]

84-000982 Kjörsvik, E.; J. Davenport and S. Lönning. OSMOTIC CHANGES DURING THE DEVELOPMENT OF EGGS AND LARVAE OF THE LUMPSUCKER, *CYCLOPTERUS LUMPUS* L. *J. Fish Biol.* 24(3):311-321. Mar. 1984. SFA 29(2)
[Inst. Biol. Geol., Univ. Tromsö, P.O.B. 3085, N-9001, Tromsö, Norway]

84-000983 Koch, F. and W. Wieser. PARTITIONING OF ENERGY IN FISH: CAN REDUCTION OF SWIMMING ACTIVITY COMPENSATE FOR THE COST OF PRODUCTION? *J. Exp. Biol.* 107:141-146. Nov. 1983. SFA 29(2)
[Inst. Zoophysiol., Univ. Innsbruck, Austria]

PHYSIOLOGY (CONTINUED)

84-000984 Koch, H. J. A. E. ONDERZOEK OVER DE HEMOGLOBINEN EN HEMOGLOBINE METAMORPHOSE BIJ *SALMO SALAR* L. [INVESTIGATION ON THE HAEMOGLOBINS AND HAEMOGLOBIN METAMORPHOSIS OF *SALMO SALAR* L.] *Ann. Soc. R. Zool. Belg.* 113:271-282. 1983. In Dutch with English and French summ. SFA 29(2)
[Zool. Inst., Kathol. Univ. Leuven, Naamestr. 59, B-3000 Leuven, Belgium]

84-000985 Koch, J. J. A. E. RÉGULATION MINÉRALE ET HÉMOGLOBINES CHEZ QUELQUES SAUMONS (*SALMO SALAR* L.) DULÇAQUICOLES. [MINERAL REGULATION AND HEMOGLOBINS IN A FEW LANDLOCKED SALMON (*SALMO SALAR* L.).] *Ann. Soc. R. Zool. Belg.* 113:259-270. 1983. In French with English summ. SFA 29(2)
[Zool. Inst., Kathol. Univ. Leuven, Naamsestr. 59, B-3000 Leuven, Belgium]

84-000986 Korsgaard, B. THE CHEMICAL COMPOSITION OF FOLLICULAR AND OVARIAN FLUIDS OF THE PREGNANT BLENNY (*ZOARCES VIVIPARUS* (L.)). *Can. J. Zool.* 61(5):1101-1108. May 1983. In English with French summ. SFA 29(2)
[Inst. Biol., Odense Univ., DK-523 Odense, Denmark]

84-000987 Koyama, Y.; M. Satou; Y. Oka and K. Ueda. INVOLVEMENT OF THE TELENCEPHALIC HEMISPHERES AND THE PREOPTIC AREA IN SEXUAL BEHAVIOR OF THE MALE GOLDFISH, *CARASSIUS AURATUS*: A BRAIN-LESION STUDY. *Behav. Neural Biol.* 40(1):70-86. Jan. 1984. SFA 29(2)
[Zool. Inst., Fac. Sci., Univ. Tokyo, Bunkyo-ku, Tokyo 113, Japan]

84-000988 Kramer, D. L. and E. A. Braun. SHORT-TERM EFFECTS OF FOOD AVAILABILITY ON AIR-BREATHING FREQUENCY IN THE FISH *CORYDORAS AENEUS* (CALLICHTHYIDAE). *Can. J. Zool.* 61(9):1964-1967. Sept. 1983. In English with French summ. SFA 29(2)
[Dep. Biol., McGill Univ., 1205 Ave. Docteur Penfield, Montreal, PQ H3A 1B1, Canada]

84-000989 Kruger, J. C. De W.; G. L. Smit; J. H. J. Van Vuren and J. T. Ferreira. SOME CHEMICAL AND PHYSICAL CHARACTERISTICS OF THE SEMEN OF *CYPRINUS CARPIO* L. AND *OREOCHROMIS MOSSAMBICUS* (PETERS). *J. Fish Biol.* 24(3):263-272. Mar. 1984. SFA 29(2)
[Dep. Zool., Rand Afrikaans Univ., P.O. Box 524, Johannesburg 2000, South Africa]

84-000990 Kurokawa, T. [CHEMICAL COMPONENT OF SARDINE CAUGHT IN THE COAST OF NAGASAKI PREFECTURE.] *Bull. Jpn. Soc. Sci. Fish.* 49(11):1741-1746. Nov. 1983. In Japanese with English summ. SFA 29(2)
[Nagasaki Pref. Inst. Fish., Matsugae-machi, Nagasaki 850, Japan]

84-000991 Kuz'mina, V. V. and A. N. Nevalennyy. EFFECT OF HYDROGEN ION CONCENTRATION ON THE ACTIVITY OF SOME CARBOHYDRASES IN THE FISH DIGESTIVE TRACT. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):114-123. 1983. SFA 29(2)
[Inst. Biol. Inland Waters, Acad. Sci. USSR-IBVV, Borok, Yaroslavl Reg., USSR]

84-000992 Labarca, P.; J. Lindstrom and M. Montal. ACETYLCHOLINE RECEPTOR IN PLANAR LIPID BILAYERS. CHARACTERIZATION OF THE CHANNEL PROPERTIES OF THE PURIFIED NICOTINIC ACETYLCHOLINE RECEPTOR FROM *TORPEDO CALIFORNICA*

PHYSIOLOGY (CONTINUED)

84-000992 CONTINUED RECONSTITUTED IN PLANAR LIPID BILAYERS. *J. Gen. Physiol.* 83(4):473-496. Apr. 1984. SFA 29(2)
[M. Montal: Dep. Biol., Univ. Calif., La Jolla 92093]

84-000993 Langdon, J. S. and J. E. Thorpe. RESPONSE OF THE GILL Na^+-K^+ ATPASE ACTIVITY, SUCCINIC DEHYDROGENASE ACTIVITY AND CHLORIDE CELLS TO SALTWATER ADAPTATION IN ATLANTIC SALMON, *SALMO SALAR* L., PARR AND SMOLT. *J. Fish Biol.* 24(3):323-331. Mar. 1984. SFA 29(2)
[J.E. Thorpe: Dep. Agric. Fish. Scotland, Freshwater Fish. Lab., Faskally, Pitlochry PH16 5LB, Scotland]

84-000994 Langille, R. M. and J. H. Youson. BILIVERDIN ACCUMULATION IN THE CAUDAL INTESTINAL SEGMENT OF JUVENILE ADULT LAMPREYS, *PETROMYZON MARINUS* L. *Can. J. Zool.* 61(8):1824-1834. Aug. 1983. In English with French summ. SFA 29(2)
[J.H. Youson: Scarborough Coll., Univ. Toronto, West Hill, ON M1C 1A4, Canada]

84-000995 Leipoldt, M. and A. Ebrecht. KINETIC ANALYSIS OF NUCLEOLAR RNA POLYMERASE I IN DIPLOID AND PHYLOGENETICALLY TETRAPLOID FISH SPECIES. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(3):483-491. 1984. SFA 29(2)
[Inst. Humangenet., Zent. Hygiene Humangenet., Univ. Göttingen, Nikolausberger Weg 5a, D-3400 Göttingen, West Germany]

84-000996 Lied, E. and G. Rosenlund. THE INFLUENCE OF THE RATIO OF PROTEIN ENERGY TO TOTAL ENERGY IN THE FEED ON THE ACTIVITY OF PROTEIN SYNTHESIS *IN VITRO*, THE LEVEL OF RIBOSOMAL RNA AND THE RNA-DNA RATIO IN WHITE TRUNK MUSCLE OF ATLANTIC COD *(GADUS MORHUA). Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):489-494. 1984. SFA 29(2)
[Inst. Nutr., Dir. Fish., P.O. Box 4285, N-5013 Nygaardstangen/Bergen, Norway]

84-000997 Lied, E. and R. Solbakken. THE COURSE OF PROTEIN DIGESTION IN ATLANTIC COD *(GADUS MORHUA). Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):503-506. 1984. SFA 29(2)
[Inst. Nutr., Dir. Fish., P.O. Box 4285, N-5013 Nygaardstangen/Bergen, Norway]

84-000998 Liem, K. F.; B. Eclancher and W. L. Fink. AERIAL RESPIRATION IN THE BANDED KNIFE FISH *GYMNOTUS CARAPO* (TELEOSTEI: GYMNOTOIDEI). *Physiol. Zool.* 57(1):185-195. Jan.-Feb. 1984. SFA 29(2)
[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

84-000999 Lindahl, K.; H. Lundqvist and M. Rydevik. PLASMA THYROXINE LEVELS AND THYROID GLAND HISTOLOGY IN BALTIC SALMON (*SALMO SALAR* L.) DURING SMOLTIFICATION. *Can. J. Zool.* 61(9):1954-1958. Sept. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Stockholm, S-106 91 Stockholm, Sweden]

PHYSIOLOGY (CONTINUED)

84-001000 Marui, T.; R. E. Evans; B. Zielinski and T. J. Hara. GUSTATORY RESPONSES OF THE RAINBOW TROUT (*SALMO GAIRDNERI*) PALATE TO AMINO ACIDS AND DERIVATIVES. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 153(4):423-433. Dec. 1983. SFA 29(2)
[T.J. Hara: Freshwater Inst., 501 University Crecent, Winnipeg, MB R3T 2N6, Canada]

84-001001 Matsumiya, M. and S. Otake. [ON THE DIAMINE OXIDASE IN THE PYLORIC CAECA AND THE INTESTINE OF COMMON MACKEREL *SCOMBER JAPONICUS.*] *Bull. Jpn. Soc. Sci. Fish.* 49(11):1695-1699. Nov. 1983. In Japanese with English summ. SFA 29(2)
[Coll. Agric. Vet. Med., Nihon Univ., Shimouma-3, Setagaya, Tokyo 154, Japan]

84-001002 McQuinn, I. H.; G. J. Fitzgerald and H. Powles. ENVIRONMENTAL EFFECTS ON EMBRYOS AND LARVAE OF THE ISLE VERTE STOCK OF ATLANTIC HERRING *(CLUPEA HARENGUS HARENGUS). Nat. Can. (Que.)* 110(3):343-355. Dec. 1983. In English with French summ. SFA 29(2)
[G.J. Fitzgerald: Dep. Biol., Univ. Laval, Sainte-Foy, PQ G1K 7P4, Canada] Atlantic Herring (*Clupea harengus harengus*) eggs from the Isle Verte (Québec) stock were incubated in the laboratory at six conbinations of temperature-salinity levels and in tidal pools subject to a wide variation in physico-chemical conditions. Data were obtained on rates of embryonic and larval development and growth, percent embryonic survival and percent total hatch and compared to data from Pacific (*Clupea harengus pallasi*), Atlantic (*Clupea harengus*) and Baltic (*Clupea harengus membras*) herring populations to examine the extent of divergence between these groups. Early development patterns of Isle Verte herring corresponded closest to those of other cold water populations in the North Atlantic. The field experiment showed a negligible effect of individually fluctuating physico-chemical parameters on percent egg survival in tidal pools. However, low oxygen concentrations combined with silt accumulation resulted in massive mortalities.

84-001003 Meghji, P. and G. Burnstock. THE EFFECT OF EDENYL COMPOUNDS ON THE HEART OF THE DOGFISH, *SCYLIORHINUS CANICULA. Comp. Biochem. Physiol. C Comp. Pharamacol. Toxicol.* 77(2):295-300. 1984. SFA 29(2)
[G. Burnstock: Cent. Neurosci., Univ. Coll. London, Gower St., London WC1E 6BT, England]

84-001004 Metcalfe, J. D. and P. J. Butler. CHANGES IN ACTIVITY AND VENTILATION IN RESPONSE TO HYPOXIA IN UNRESTRAINED, UNOPERATED DOGFISH (*SCYLIORHINUS CANICULA* L.). *J. Exp. Biol.* 108:411-418. Jan. 1984. SFA 29(2)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, P.O. Box 363, Birmingham, England]

84-001005 Miki, W. ; K. Yamaguchi and S. Konosu. CAROTENOID COMPOSITION OF ALASKA POLLACK ROE AT DIFFERENT STAGES OF MATURATION. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1615. Oct. 1983. SFA 29(2)
[Lab. Mar. Biochem., Fac. Agric., Univ. Tokyo, Bunkyo, Tokyo 113, Japan]

84-001006 Miller, C. A.; A. J. Fivizzani and A. H. Meier. WATER TEMPERATURE INFLUENCES SALINITY SELECTION IN THE GULF KILLIFISH, *FUNDULUS GRANDIS. Can. J. Zool.* 61(6):1265-1269. June 1983. In English with French

PHYSIOLOGY (CONTINUED)

84-001006 CONTINUED summ. SFA 29(2)
[Dep. Zool., La. State Univ., Baton Rouge 70803] Salinity selection of *Fundulus grandis* acclimated for at least 2 weeks to water temperatures of either 20 or 28°C was tested at 23°C in salinity gradient chambers (0, 7, 14, 21, 28, 35°/oo) at three seasons of the year. In October and March, fish acclimated to 28°C selected lower salinities (October, 7.7°/oo; March 9.6°/oo) than those selected by fish held at 20°C (October, 17.5°/oo; March, 17.4°/oo). However, no differential effect of acclimation temperature was observed during the postspawning period in July (28°C acclimation, 15.4°/oo; 20°C acclimation, 13.0°/oo). It was further observed in tests conducted in April that the water temperature of the salinity gradient chamber also influenced salinity selection; warmer water (28°C) promoted selection of lower salinities than cooler water (20°C) in both 20 and 28°C acclimated fish. Our results indicate that water temperature can have both proximate as well as longer term (ultimate) influences on salinity selection of *F. grandis* except during a postspawning period when they are refractory to the influences of acclimation temperature.

84-001007 Miller, T. K. and J. Levin. THE EFFECTS OF MULTIPLE INJECTIONS OF BACTERIAL ENDOTOXIN ON BLOOD COAGULATION IN THE TOADFISH, *OPSANUS TAU*. *Biol. Bull.* 166(1):189-205. Feb. 1984. SFA 29(2)
[J. Levin: Vet. Admin. Hosp., 113A, 4150 Clement St., San Francisco, CA 94121]

84-001008 Mishvelov, E. G. RELATIONSHIP BETWEEN GROWTH RATE AND BODY WATER CONTENT OF CARP, *CYPRINUS CARPIO* (CYPRINIDAE), INFLUENCED BY SCALE COVER AND TEMPERATURE. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):144-147. 1983. SFA 29(2)
[IEMEZH, Moscow, USSR]

84-001009 Mohamad Kasim, H. EFFECT OF TEMPERATURE ON RESPIRATION OF *LABEO FIMBRIATUS* (BLOCH). *Indian J. Fish.* 29(1-2):85-93. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Veraval, India] *Labeo fimbriatus* (Bloch) was tested at non-lethal temperatures to measure its oxygen dependent and independent zones. The metabolic rate was almost uniform in oxygen independent zone, in oxygen dependent zone reduced drastically and then oxygen level becomes lethal. This species regulated the oxygen consumption at lower rate at extreme high and low temperatures than at intermediary optimum temperatures. The lethal oxygen level was much higher at low temperatures, whereas it was the lowest at optimum temperature. The highest lethal oxygen level at low temperature is attributed to the inhibition in oxygen uptake. Cold-acclimated fish consumed more oxygen than the warm-acclimated fish. The time to death was the highest at low temperature.

84-001010 Mohsin, A. K. M.; S. H. Cheah and M. A. Ambak. LETHAL SALINITY OF YOUNG SEABARAU. *Malay. Appl. Biol.* 12(2):45-48. Dec. 1983. SFA 29(2)
[Fac. Fish. Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia]

84-001011 Moon, T. W. CHANGES IN TISSUE ION CONTENTS AND ULTRASTRUCTURE OF FOOD-DEPRIVED IMMATURE AMERICAN EELS, *ANGUILLA ROSTRATA* (LeSUEUR). *Can. J. Zool.* 61(4):812-821. Apr. 1983. In English with French summ.

PHYSIOLOGY (CONTINUED)

84-001011 CONTINUED SFA 29(2)
[Huntsman Mar. Lab., Brandy Cove, St. Andrew, NB E0G 2X0, Canada]

84-001012 Moon, T. W. METABOLIC RESERVES AND ENZYME ACTIVITIES WITH FOOD DEPRIVATION IN IMMATURE AMERICAN EELS, *ANGUILLA ROSTRATA* (LeSUEUR). *Can. J. Zool.* 61(4):802-811. Apr. 1983. In English with French summ. SFA 29(2)
[Huntsman Mar. Lab., Brandy Cove, St. Andrews, NB E0G 2X0, Canada]

84-001013 Morisawa, M.; K. Suzuki; H. Shimizu; S. Morisawa and K. Yasuda. EFFECTS OF OSMOLALITY AND POTASSIUM ON MOTILITY OF SPERMATOZOA FROM FRESHWATER CYPRINID FISHES. *J. Exp. Biol.* 107:95-103. Nov. 1983. SFA 29(2)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

84-001014 Morisawa, M.; K. Suzuki and S. Morisawa. EFFECTS OF POTASSIUM AND OSMOLALITY ON SPERMATOZOAN MOTILITY OF SALMONID FISHES. *J. Exp. Biol.* 107:105-113. Nov. 1983. SFA 29(2)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

84-001015 Munkittrick, K. R. and J. F. Leatherland. SEASONAL CHANGES IN THE PITUITARY-GONAD AXIS OF FERAL GOLDFISH, *CARASSIUS AURATUS* L., FROM ONTARIO, CANADA. *J. Fish Biol.* 24(1):75-90. Jan. 1984. SFA 29(2)
[Dep. Zool., Coll. Biol. Sci., Univ. Guelph, Guelph, ON, Canada]

84-001016 Murai, T.; T. Akiyama and T. Nose. EFFECTS OF GLUCOSE CHAIN LENGTH OF VARIOUS CARBOHYDRATES AND FREQUENCY OF FEEDING ON THEIR UTILIZATION BY FINGERLING CARP. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1607-1611. Oct. 1983. SFA 29(2)
[Div. Fish Nutr., Natl. Res. Inst. Aquacult., Tamaki, Watarai, Mie 519-04, Japan]

84-001017 Narasimha Moorthy, C. V.; V. Krishna Murthy; G. Vemananda Reddy; B. Bhaskara Haranath, P. Reddanna and S. Govindappa. EFFECT OF STARVATION AND REFEEDING ON TISSUE PROXIMATE ANALYSIS OF HEPATIC AND MUSCULAR TISSUES OF *TILAPIA MOSSAMBICA* (PETERS). *Indian J. Fish.* 27(1-2):215-219. 1980. SFA 29(2)
[Dep. Zool., Sri Venkataeswara Univ., Tirupati 517502, India]

84-001018 Neas, N. P. TROUT LIVER PHOSPHOLIPASE A_2 AND ITS ROLE IN MEMBRANE ADAPTATIONS TO TEMPERATURE. *Ph.D. dissertation, Ariz. State Univ.* 165p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(8):2357. Feb. 1984. SFA 29(2)

84-001019 Neil, W. H.; R. G. Fechhelm; B. J. Gallaway; J. D. Bryan and S. W. Anderson. MODELING MOVEMENTS AND DISTRIBUTION OF ARCTIC CISCO (*COREGONUS AUTUMNALIS*) RELATIVE TO TEMPERATURE - SALINITY REGIMES OF THE BEAUFORT SEA NEAR THE WATERFLOOD CAUSEWAY, PRUDHOE BAY, ALASKA. *Univ. Alaska Biol. Pap.* No. 21. p. 39-61. Dec. 1983. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843] A

PHYSIOLOGY (CONTINUED)

84-001019 CONTINUED mechanistic model was developed to evaluate the movement patterns of small Arctic cisco relative to environmental heterogeneity associated with the Waterflood Causeway, a gravel pier that projects 3.9 km into the Beaufort Sea from the Alaskan coast near Prudhoe Bay. Fish movement and resultant changes in density were treated as a donor-controlled drift process biased by experimentally determined temperature preferences (given temperature and salinity acclimation) of the fish. Simulated fish density was significantly rank-correlated with actual catch. Goodess-of-fit was improved when observed data were filtered to remove the effects of presumed high-frequency changes in fish catchability. Under the assumption of model validity, small Arctic cisco make appropriate use of the causeway's breach as a passageway. Causeway-induced variation in water quality during August 1981 directed fish movement in a manner that should reduce entrainment and impingement potential of planned water-intake structures, although these same water quality differences resulted in an estimated 7 percent reduction in fish density that would have been present in the area had environmental heterogeneity provided no directional bias in fish movements.

84-001020 Nishiyama, T.; R. K. Harris and L. F. Chen. FOOD ENERGY REQUIREMENT OF LARVAL AND JUVENILE WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA* (PALLAS), IN THE SOUTHEAST BERING SEA. *Proc. Alaska Sci. Conf.* 33:175. 1982. Abstract only. SFA 29(2)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701]

84-001021 Nozaki, M. and A. Gorbman. DISTRIBUTION OF IMMUNOREACTIVE SITES OF SEVERAL COMPONENTS OF PRO-OPIOCORTIN IN THE PITUITARY AND BRAIN OF ADULT LAMPREYS, *PETROMYZON MARINUS* AND *ENTOSPHENUS TRIDENTATUS*. *Gen. Comp. Endocrinol.* 53(3):335-352. Mar. 1984. SFA 29(2)
[Primate Res. Inst., Kyoto Univ., Inuyama, Aichi 484, Japan]

84-001022 Ogasawara, T. and T. Hirano. EFFECTS OF PROLACTIN AND ENVIRONMENTAL CALCIUM ON OSMOTIC WATER PERMEABILITY OF THE GILLS IN THE EEL, *ANGUILLA JAPONICA*. *Gen. Comp. Endocrinol.* 53(2):315-324. Feb. 1984. SFA 29(2)
[Ocean Res. Inst., Univ. Tokyo, Nakano, Tokyo 164, Japan]

84-001023 Olcese, J. M.; T. R. Hall; H. R. Figueroa and V. L. DeVlaming. EFFECTS OF CLOMIPHENE CITRATE, A NONSTEROIDAL ANTIESTROGEN, ON BRAIN MONOAMINERGIC MECHANISMS IN FEMALE GOLDFISH, *CARASSIUS AURATUS* *Comp. Biochem. Physiol. Comp. Pharmacol. Toxicol.* 77(2):335-337. 1984. SFA 29(2)
[Dep. Biol., Southwestern at Memphis, Memphis, TN 38112]

84-001024 Ostrander, G. K. and M. S. Lamon. AN ANALYSIS OF SUCCESSIVE SPAWNS OF ORANGE CHROMIDES, *ETROPLUS MACULATUS*. *Trans. Ill. State Acad. Sci.* 76(1-2):161-163. 1983. SFA 29(2)
[Dep. Biol. Sci., Ill. State Univ., Normal 61761]

84-001025 Oyaveyer, E. A. FECUNDITY OF SPRING HERRING, *CLUPEA HARENGUS MEMBRAS* (CLUPEIDAE), FROM THE NORTHEASTERN AND NORTHERN BALTIC SEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):75-85. 1983.

PHYSIOLOGY (CONTINUED)

84-001025 CONTINUED SFA 29(2)
[BaltNIRHk, Tallin, USSR]

84-001026 Palfrey, H. C.; P. Silva and F. H. Epstein. SENSITIVITY OF cAMP-STIMULATED SALT SECRETION IN SHARK RECTAL GLAND TO "LOOP" DIURETICS. *Am. J. Physiol.* 246(3):C242-C246. Mar. 1984. SFA 29(2)
[Mount Desert Island Biol. Lab., Salsbury Cove, ME 04672]

84-001027 Parwez, I.; S. V. Goswami and B. I. Sundararaj. EFFECTS OF HYPOPHYSECTOMY ON SOME OSMOREGULATORY PARAMETERS OF THE CATFISH, *HETEROPNEUSTES FOSSILIS* (BLOCH). *J. Exp. Zool.* 229(3):375-381. Mar. 1984. SFA 29(2)
[S.V. Goswami: Dep. Zool., Univ. Delhi, Delhi 110007, India]

84-001028 Pastor, S. M. OBSERVATIONS ON HEMATOCRIT AND BODY FORM OF HATCHERY-REARED LAKE TROUT. *Prog. Fish-Cult.* 45(4):191-195. Oct. 1983. SFA 29(2)
[U.S. FWS, Iron River Natl. Fish Hatchery, P.O. Box 37, Iron River, WI 54847]

84-001029 Penczak, T.; E. Kusto; D. Krzyzanowska; M. Molinski and E. Suszycka. FOOD CONSUMPTION AND ENERGY TRANSFORMATIONS BY FISH POPULATIONS IN TWO SMALL LOWLAND RIVERS IN POLAND. *Hydrobiologia* 108(2):135-144. 16 Jan. 1984. SFA 29(2)
[Inst. Environ. Biol., Univ. Lódz, Lódz, Poland] The food consumption of all fish species was estimated at nine sites in two lowland rivers. The fish populations, whose diet consisted chiefly of invertebrates (88%), used on the average 9.88 (7.14-13.3) kg of invertebrates for the production of 1 kg of fish flesh. This number of invertebrates corresponds to 39.35 ± 7.34 MJ (bar x ± S.D.). In estimating the effective use of consumed (K_1) and assimilated (K_2) food for growth, it was found that the predominance of food of animal origin over plant or detrital food resulted in a decrease in the living cost (maintenance ration) of fish.

84-001030 Pfeiler, E. CHANGES IN WATER AND SALT CONTENT DURING METAMORPHOSIS OF LARVAL BONEFISH (*ALBULA*). *Bull. Mar. Sci.* 34(2):177-184. Mar. 1984. SFA 29(2)
[Inst. Tec. Estud. Super. Monterrey, Esc. Cienc. Mar. Aliment., Apt. Post. 484, Guaymas, Sonora, Mexico 85400]

84-001031 Ramsey, A. L. and S. H. Gruber. RADIOGRAPHIC DETERMINATION OF GUT TRANSIT TIME IN THE JUVENILE LEMON SHARK, *NEGAPRION BREVIROSTRIS*. *Fla. Sci.* 47(Suppl. 1):15. Mar. 1984. Abstract only. SFA 29(2)
[Univ. Miami, Miami, FL 33149] As part of an overall bioenergetic study of lemon sharks we measured gut transit time of a standard meal at 4 feeding levels: 1) constant 50g meal; 2) 2.7% body weight per meal (below maintenance ration); 3) 6.2% bw (maintenance); 4) *ad libitum*. Meals consisted of bluerunner (*C. chrysos*) steaks to which 2g of radiopaque $BaSO_4$ had been added. Sharks (0.9-1.9kg) maintained in recirculating tanks at 25°C and 30 ppt were individually x-rayed at 3h intervals. In all cases (19 sharks; 4 feeding levels) evacuation was completed within 72-80h. The minimum gut transit time as determined by dyed meals was approximately

PHYSIOLOGY (CONTINUED)

84-001031 CONTINUED 14h. Thus, to measure assimilation efficiency, a shark must be starved for 4 days, fed, and fecal collection maintained thereafter for at least 80h.

84-001032 Ridelman, J. M.; R. W. Hardy and E. L. Brannon. THE EFFECT OF SHORT-TERM STARVATION ON OVARIAN DEVELOPMENT AND EGG VIABILITY IN RAINBOW TROUT *(SALMO GAIRDNERI). Aquaculture* 37(2):133-140. 1 Mar. 1984. SFA 29(2)
[Sch. Fish., Univ. Wash., Seattle] Adult female rainbow trout (*Salmo gairdneri*) were fed a commercial trout production diet until approximately 40 days prior to spawning at which time the fish were divided in two groups. One group continued to be fed while the other group was starved until spawning. Egg size, egg number, ovary weight, and egg proximate composition were examined periodically starting 5 months before spawning. Muscle tissues of the fish were sampled at spawning to measure somatic depletion of proximate consituents in the two groups. Egg hatchability was determined by incubating test lots from each spawning female. No significant differences (P>0.05) were found in egg hatchability between the fed and starved groups. Changes in proximate composition were observed in the eggs during the months prior to spawning, but no differences were detected between the eggs of the starved and the fed groups. Short-term starvation did not significantly alter the proximate composition of muscle tissue of the spawned female trout.

84-001033 Rigaut, J. P. and M. T. Chalumeau. PYRUVATE KINASE ISOZYME PATTERNS OF FISH. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(3):451-458. 1984. SFA 29(2)
[Lab. Biol. Dev., U.E.R Biomed., Univ. Paris-Nord, 74 rue Marcel Cachin, 93012-Bobigny-Cédex, France]

84-001034 Robertson, J. D. THE COMPOSITION OF BLOOD PLASMA AND PARIETAL MUSCLE OF OSLO FJORD EELS [*ANGUILLA ANGUILLA* (L.)] AND THE RIVER LAMPREY [*LAMPETRA FLUVIATILIS* (L.)]. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):431-439. 1984. SFA 29(2)
[Zool. Dep., Univ. Glasgow, Glasgow G12 8QQ, U.K.]

84-001035 Rodrigues, K. T. and J. P. Sumpter. THE RADIOIMMUNOASSAY OF α-MELANOCYTE-STIMULATING HORMONE AND ENDORPHIN IN TROUT (*SALMO GAIRDNERI*) AND THE EFFECT OF BLINDING ON THE PLASMA LEVELS OF THESE PEPTIDES. *Gen. Comp. Endocrinol.* 54(1):69-75. Apr. 1984. SFA 29(2)
[Dep. Appl. Biol., Fac. Math. Sci., Brunel Univ., Uxbridge, Middlesex, UB83PH, U.K.]

84-001036 Rosenlund, G.; B. Lund; K. Sandnes; O. R. Braekkan and A. Von der Decken. MUSCLE PROTEIN SYNTHESIS IN VITRO OF SAITHE (*POLLACHIUS VIRENS*) CORRELATED TO GROWTH AND DAILY ENERGY INTAKE. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(1):7-13. 1984. SFA 29(2)
[A Von der Decken: Wenner-Gren Inst., Nortullsgatan 16, S-113 45 Stockholm, Sweden]

84-001037 Sakai, D. K. OPSONIZATION BY FISH ANTIBODY AND COMPLEMENT IN THE IMMUNE PHAGOCYTOSIS BY PERITONEAL EXUDATE CELLS ISOLATED FROM SALMONID FISHES. *J. Fish Dis.* 7(1):29-38. Jan. 1984. SFA 29(2)
[Hokkaido Fish Hatchery, Nakanoshima 2, Toyohira, Sapporo 062, Japan]

PHYSIOLOGY (CONTINUED)

84-001038 Sakai, T.; H. Kawatsu and S. Umemura. EFFECTS OF pH AND TEMPERATURE ON MIXED-FUNCTION OXIDASES IN THE LIVER OF CULTURED FISH. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1839-1842. Dec. 1983. SFA 29(2)
[Fac. Agric., Miyazaki Univ., Funatsuka-3, Miyazaki 880, Japan]

84-001039 Sakai, T.; O. Gotoh and H. Kawatsu. THE COMPOSITION OF BILIRUBIN CONJUGATES IN PISCINE BILES. *Bull. Jpn. Soc. Sci. Fish.* 49(12):1835-1838. Dec. 1983. SFA 29(2)
[Fac. Agric., Miyazaki Univ., Funatsuka-3, Mujazaki 880, Japan]

84-001040 Sandor, T.; J. A. DiBattista and A. Z. Mehdi. GLUCOCORTICOID RECEPTORS IN THE GILL TISSUE OF FISH. *Gen. Comp. Endocrinol.* 53(3):353-364. Mar. 1984. SFA 29(2)
[Lab. Endocrinol., Hosp. Notre-Dame, Case Postale 1560, Succursale C, Montreál, PQ H2L 4K8, Canada]

84-001041 Schulz, R. and R. Schlaghecke. A RECEPTOR PREPARATION FROM TESTES OF *SALMO GAIRDNERI* (RICHARDSON): *IN VITRO* BINDING STUDIES WITH ^{125}I-LABELED hCG AND TROUT PITUITARY PROTEINS. *Gen. Comp. Endocrinol.* 54(1):132-138. Apr. 1984. SFA 29(2)
[Ruhr-Univ. Bochum, Arbeitsgr. Ver. Endokrinol., ND 5/27, Universitatsstr. 150, 4630 Bochum 1, West Germany]

84-001042 Schweitzer, J. THE PHYSIOLOGICAL AND ANATOMICAL LOCALIZATION OF TWO ELECTRORECEPTIVE DIENCEPHALIC NUCLEI IN THE THORNBACK RAY, *PLATYRHINOIDIS TRISERIATA*. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 153(3):331-341. Nov. 1983. SFA 29(2)
[Neurobiol. Unit, Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

84-001043 Secombes, C. J. and J. W. Resink. THE IMMUNE RESPONSE OF CARP, *CYPRINUS CARPIO* L., FOLLOWING INJECTION OF ANTIGEN-ANTIBODY COMPLEXES. *J. Fish Biol.* 24(2):193-200. Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Aberdeen, Tillydrone Ave., Aberdeen AB9 2TN, Scotland]

84-001044 Sidell, B. D.; D. B. Stowe and C. A. Hansen. CARBOHYDRATE IS THE PREFERRED METABOLIC FUEL OF THE HAGFISH (*MYXINE GLUTINOSA*) HEART. *Physiol. Zool.* 57(2):266-273. Mar.-Apr. 1984. SFA 29(2)
[Dep. Zool., Univ. Me., Orono 04469]

84-001045 Sidell, B. D.; I. A. Johnston; T. S. Moerland and G. Goldspink. THE EURYTHERMAL MYOFIBRILLAR PROTEIN COMPLEX OF THE MUMMICHOG (*FUNDULUS HETEROCLITUS*): ADAPTATION TO A FLUCTUATING THERMAL ENVIRONMENT. *J. Comp. Physiol. B Biochem. Syst. Environ. Physiol.* 153(2):167-173. Oct. 1983. SFA 29(2)
[Dep. Zool., Univ. Me., Orono 04469]

84-001046 Sleet, R. B. and L. J. Weber. WATER AND ELECTROLYTE IMBALANCES ASSOCIATED WITH LABORATORY MANIPULATION OF A MARINE TELEOST INVOLVE THE GUT. *Can. J. Zool.* 61(6):1202-1206. June 1983. In English with French summ. SFA 29(2)
[Dep. Pharmacol. Toxicol., Ariz. Health Sci. Cent., Tucson, AZ 85724]

PHYSIOLOGY (CONTINUED)

84-001047 Sonski, A. J. HEAT TOLERANCE OF REDBAND TROUT. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:66-76. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Ingram 78025] Upper lethal temperatures (LT_{50}) were determined for redband trout (*Salmo* sp.) that had been acclimated to 15, 20 and 23 C and exposed to temperature increases of 0.5 C/day until death. Temperatures at time of death ranged from 25.5 to 27.7 C. The LT_{50} for fish acclimated to 20 C (27.4) was significantly higher ($\alpha = 0.05$) from those of 15-(27.1) and 23-C (26.8) acclimated fish.

84-001048 Sower, S. A.; W. W. Dickhoff; A. Gorbman; J. E. Rivier and W. W. Vale. OVULATORY AND STEROIDAL RESPONSES IN THE LAMPREY FOLLOWING ADMINISTRATION OF SALMON GONADOTROPIN AND AGONISTIC AND ANTAGONISTIC ANALOGUES OF GONADOTROPIN-RELEASING HORMONE. *Can. J. Zool.* 61(12):2653-2659. Dec. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. N. H., Durham 03824]

84-001049 Specker, J. L. and C. B. Schreck. INFLUENCE OF AMBIENT SALTS ON PLASMA THYROXINE CONCENTRATION IN JUVENILE COHO SALMON. *Trans. Am. Fish. Soc.* 113(1):90-94. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Calif., Berkeley 94720]

84-001050 Squires, E. J. and L. A. W. Feltham. STUDIES ON N^{ε}(γ-GLUTAMYL)LYSINE ISODIPEPTIDE IN THE WINTER FLOUNDER (*PSEUDOPLEURONECTES AMERICANUS*). *Can. J. Zool.* 61(10):2219-2223. Oct. 1983. In English with French summ. SFA 29(2)
[Dep. Biochem., Memorial Univ. Newfoundland, St. John's, NF A1B 3X9, Canada]

84-001051 Stacey, N. E.; R. E. Peter; A. F. Cook; B. Truscott; J. M. Walsh and D. R. Idler. CHANGES IN PLASMA CONCENTRATIONS OF GONADOTROPIN, 17β-ESTRADIOL, TESTOSTERONE, AND 17α-HYDROXY-20β-DIHYDROPROGESTERONE DURING SPONTANEOUS AND BRAIN LESION INDUCED OVULATION IN GOLDFISH. *Can. J. Zool.* 61(12):2646-2652. Dec. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

84-001052 Stacey, N. HORMONES AND PHEROMONES IN FISH SEXUAL BEHAVIOR. *BioScience* 33(9):552-556. Oct. 1983. SFA 29(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 2E9, Canada]

84-001053 Storch, V.; J. V. Juario and F. P. Pascual. EARLY EFFECTS OF NUTRITIONAL STRESS ON THE LIVER OF MILKFISH, *CHANOS CHANOS* (FORSSKAL), AND ON THE HEPATOPANCREAS OF THE TIGER PRAWN, *PANAEUS MONODON* (FABRICIUS). *Aquaculture* 36(3):229-236. 15 Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Heidelberg, Im Neuenheimer Feld 230, 69 Heidelberg, West Germany]

84-001054 Stuart R. E.; J. L. Hedtke and L. J. Weber. PHYSIOLOGICAL AND PHARMACOLOGICAL INVESTIGATION OF THE NONVASCULARIZED MARINE TELEOST HEART WITH ADRENERGIC AND CHOLINERGIC AGENTS. *Can. J. Zool.* 61(9):1944-1948. Sept. 1983. In English with French summ. SFA 29(2)
[Mar. Sci. Cent., Oreg. State Univ., Newport 97365]

PHYSIOLOGY (CONTINUED)

84-001055 Suzuki, T. and M. Suyama. FREE AMINO ACIDS AND PHOSPHOPEPTIDES IN THE EXTRACTS OF FISH EGGS. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1747-1753. Nov. 1983. SFA 29(2)
[Tokyo Univ. Fish., Konan-4, Minato, Tokyo 108, Japan]

84-001056 Takahashi, A.; H. Kawauchi; T. Mouri and A. Sasaki. CHEMICAL AND IMMUNOLOGICAL CHARACTERIZATION OF SALMON ENDORPHINS. *Gen. Comp. Endocrinol.* 53(3):381-388. Mar. 1984. SFA 29(2)
[Lab. Molec. Endocrinol., Sch. Fish. Sci., Kitasato Univ., Sanriku, Iwate 022-01, Japan]

84-001057 Teräväinen, T. IN VITRO BIOSYNTHESIS OF 11ß-HYDROXYLATED NEUTRAL STEROIDS BY TESTES OF A VIVIPAROUS TELEOST, *ZOARCES VIVIPARUS* (L.), DURING SPERMIOGENESIS. *Ann. Zool. Fenn.* 20(4):307-310. 1983. SFA 29(2)
[Dep. Med. Biol., Univ. Helsinki, Siltavuorenpenger 20A, SF-00170 Helsinki 17, Finland]

84-001058 Thibault, R. E. and R. J. Schultz. REPRODUCTIVE ADAPTATIONS AMONG VIVIPAROUS FISHES (CYPRINODONTIFORMES: POECILIIDAE). *Evolution* 32(2):320-333. June 1978. SFA 29(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403]

84-001059 Thorson, T. B.; D. R. Brooks and M. A. Mayes. THE EVOLUTION OF FRESHWATER ADAPTATION IN STINGRAYS. *Natl. Geogr. Soc. Res. Rep.* 15:663-694. 1983. SFA 29(2)
[Sch. Life Sci., Univ. Nebr., Lincoln]

84-001060 Tirri, R. and H. Lehto. ALPHA AND BETA ADRENERGIC CONTROL OF CONTRACTION FORCE OF PERCH HEART (*PERCA FLUVIATILIS*) *IN VITRO*. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(2):301-304. 1984. SFA 29(2)
[Lab. Anim. Physiol., Dep. Biol., Univ. Turku, 20500 Turku 50, Finland]

84-001061 Tocher, D. R. and J. R. Sargent. STUDIES ON TRIACYLGYCEROL, WAX ESTER AND STEROL ESTER HYDROLASES IN INTESTINAL CAECA OF RAINBOW TROUT (*SALMO GAIRDNERI*) FED DIETS RICH IN TRIACYLGLYCEROLS AND WAX ESTERS. *Comp. Biochem. Phsyiol. B Comp. Biochem.* 77(3):561-571. 1984. SFA 29(2)
[Natl. Environ. Res. Counc., Inst. Mar. Biochem., St. Fittick's Rd., Aberdeen AB1 3RA, Scotland]

84-001062 Toews, D. P.; G. F. Holeton and N. Heisler. REGULATION OF THE ACID-BASE STATUS DURING ENVIRONMENTAL HYPERCAPNIA IN THE MARINE TELEOST FISH *CONGER CONGER*. *J. Exp. Biol.* 107:9-20. Nov. 1983. SFA 29(2)
[Dep. Biol., Univ. Acadia, Wolfville, NS, Canada]

84-001063 Tormosova, I. D. VARIATION IN THE AGE AT MATURITY OF THE NORTH SEA HADDOCK, *MELANOGRAMMUS AEGLEFINUS* (GADIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):68-74. 1983. SFA 29(2)

PHYSIOLOGY (CONTINUED)

84-001063 CONTINUED
[AtlantNIRO, Kaliningrad, USSR] The growth rate and maturation of the North Sea haddock, *Melanogrammus aeglefinus*, was studied from specimens collected from 1966 to 1976 against a background of long-term fluctuations in the hydrologic regime. The warming of the North Atlantic in the 1930's-1950's caused an increase in growth rate and earlier sexual maturity in fish. This led to a change (rejuvenation) in the age composition of the population.

84-001064 Torrissen, K. R. and O. J. Torrissen. DIGESTIVE PROTEASES OF ATLANTIC SALMON (*SALMO SALAR*) FROM DIFFERENT RIVER STRAINS: DEVELOPMENT AFTER HATCHING, REARING TEMPERATURE EFFECT AND EFFECT OF SEX AND MATURATION. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(1):15-20. 1984. SFA 29(2)
[Inst. Mar. Res., Matre Aquacult. Stn., N-5198 Matredal, Norway]

84-001065 Townshend, T. J. and R. J. Wootton. EFFECTS OF FOOD SUPPLY ON THE REPRODUCTION OF THE CONVICT CICHLID, *CICHLASOMA NIGROFASCIATUM*. *J. Fish Biol.* 24(1):91-104. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, Dyfed, Wales] *Cichlasoma nigrofasciatum*, the convict cichlid, is a biparental, substrate-spawning, Central American cichlid. Male-female pairs were kept for 4 months on one of three food rations: high - 1g food daily; medium - 1 g three times per week; low - 1 g per week. The number of spawnings was directly related to the food ration. The fecundity of the females on the medium rations declined. At all rations the inter-spwaning interval and egg size increased during the experiment. Egg size was positively related to ration and the length of the interspwaning inyterval, but the latter was inversely related to ration. Females on the high ration grew in weight while those on the low ration lost weight. Histological examination of the ovaries at the end of the experiment suggested that low rations reduced the proportion of oocytes that become vitellogenic. At the end of the experiment, the total, gonad and liver weight of females at a given length were significantly related to ration. No similar, significant effect was found for the males, although growth in length of the males was related to ration. Ration had no detectable effect on the histological appearance of the testes.

84-001066 Ueda, H.; O. Hiroi; A. Hara; K. Yamauchi and Y. Nagahama. CHANGES IN SERUM CONCENTRATIONS OF STEROID HORMONES, THYROXINE, AND VITELLOGENIN DURING SPAWNING MIGRATION OF THE CHUM SALMON, *ONCORHYNCHUS KETA*. *Gen. Comp. Endocrinol.* 53(2):203-211. Feb. 1984. SFA 29(2)
[Y. Nagahama: Lab. Reprod. Biol., Natl. Inst. Basic Biol., Okazaki 444, Japan]

84-001067 Urban, E. ENERGY BALANCE AND NITROGEN CHANGES OF GRASS CARP (*CTENOPHARYNGODON IDELLA* VAL.) LARVAE AND FRY UNDER DIFFERENT FOOD CONDITIONS. *Ekol. Pol.* 30(3-4):327-391. 1983. In English with Polish summ. SFA 29(2)
[Dep. Ecol. Bioenergetics, Inst. Ecol., Polish Acad. Sci., Dziekanów Lesny 05-092 Lomianki, Poland]

84-001068 Van den Hurk, R. and J. G. D. Lambert. OVARIAN STEROID GLUCURONIDES FUNCTION AS SEX PHEROMONES FOR MALE ZEBRAFISH, *BRACHYDANIO RERIO*. *Can. J. Zool.* 61(11):2381-2387. Nov. 1983. In English with French summ. SFA 29(2)
[Zool. Lab., Sect. Comp. Endocrinol., State Univ. Utrecht, Utrect, Netherlands]

PHYSIOLOGY (CONTINUED)

84-001069 Van den Thillart, G.; D. Randall and L. Hoa-Ren. CO_2 AND H^+ EXCRETION BY SWIMMING COHO SALMON, *ONCORHYNCHUS KISUTCH*. *J. Exp. Biol.* 107:169-180. Nov. 1983. SFA 29(2)
[State Univ. Leiden, Gorlaeus Lab., Dep. Anim. Physiol., Wassenaarseweg 76, P.O. Box 9502, 2300 RA Leiden, Netherlands]

84-001070 Van Eys, G. J. J. M.; C. W. G. M. Löwik; P. M. J. M Cruijsen and S. E. Wendelaar Bonga. BIOSYNTHESIS OF MELANOTROPINS AND ENDORPHINS BY THE LEAD-HAEMATOXYLIN POSITIVE CELLS IN PARS INTERMEDIA OF THE CICHLID TELEOST *SAROTHERODON MOSSAMBICUS*. *Comp. Biochem. Physiol. B Comp. Biochem.* 77(1):135-142. 1984. SFA 29(2)
[Lab. Biochem., NCI Bldg. 37, Room 4D-02, Natl. Inst. Health, Bethesda, MD 20205]

84-001071 Virtanen, E.; K. Westman and A. Soivio. LOHEN LUONNONPOIKASTEN JA VILJELTYJEN POIKASTEN FYSIOLOGINEN TILA JA VAELLUSVALMIUS. [PHYSIOLOGICAL CONDITION AND SMOLTIFICATION IN WILD AND HATCHERY-REARED YOUNG ATLANTIC SALMON, *SALMO SALAR*.] *Suom. Kalatalous* No. 49. p. 57-73. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

84-001072 Wallén, P. and T. L. Williams. FICTIVE LOCOMOTION IN THE LAMPREY SPINAL CORD *IN VITRO* COMPARED WITH SWIMMING IN THE INTACT AND SPINAL ANIMAL. *J. Physiol. (Lond.)* 347:225-239. Feb. 1984. SFA 29(2)
[Dep. Physiol. III, Karolinska Inst., Lidingövägen 1, S-114 33 Stockholm, Sweden]

84-001073 Warner, R. R. and R. K. Harlan. SPERM COMPETITION AND SPERM STORAGE AS DETERMINANTS OF SEXUAL DIMORPHISM IN THE DWARF SURFPERCH, *MICROMETRUS MINIMUS*. *Evolution* 36(1):44-55. Jan. 1982. SFA 29(2)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

84-001074 Wells, R. M. G.; M. E. Forster and A. S. Meredith. BLOOD OXYGEN AFFINITY IN THE AMPHIBIOUS FISH *NEOCHANNA BURROWSIUS* (GALAXIIDAE: SALMONIFORMES). *Physiol. Zool.* 57(2):261-265. Mar.-Apr. 1984. SFA 29(2)
[Dep. Zool., Univ. Auckland, New Zealand]

84-001075 White, A. and T. C. Fletcher. RADIOIMMUNOASSAY OF SERUM CORITSOL IN THE PLAICE (*PLEURONECTES PLATESSA* L.). *Gen. Comp. Endocrinol.* 53(3):410-417. Mar. 1984. SFA 29(2)
[NERC Inst. Mar. Biochem., St. Fittick's Rd., Aberdeen, AB1 3RA, Scotland]

84-001076 Wickes, E. G.; L. T. Smith and T. L. Meade. CHANGES IN KEYS-WILLMER CELL NUMBERS IN THE GILLS OF STEELHEAD TROUT DURING SMOLTIFICATION. *Prog. Fish-Cult.* 45(4):195-198. Oct. 1983. SFA 29(2)
[Dep. Aquacult. Sci. Pathol., Univ. R.I., Kingston 02881]

84-001077 Willemse, J. J.; L. Markus-Silvis and G. H. Ketting. MORPHOLOGICAL EFFECTS OF STRESS IN CULTURED ELVERS, *ANGUILLA ANGUILLA* (L.). *Aquaculture* 36(3):193-201. 15 Jan. 1984. SFA 29(2)
[Dep. Anat., Erasmus Univ., P.O. Box 1738, 3000 DR Rotterdam, Netherlands]

PHYSIOLOGY (CONTINUED)

84-001078 Witas, H.; T. Gabryelak and B. Matkovics. COMPARATIVE STUDIES ON SUPEROXIDE DISMUTASE AND CATALASE ACTIVITIES IN LIVERS OF FISH AND OTHER ANTARCTIC VERTEBRATES. *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(2):408-411. 1984. SFA 29(2)
[Inst. Biochem. Biophys., Dep. Biophys., Univ. Lódy, Lódy, Poland]

84-001079 Wokoma, A. and I. A. Johnston. ANAEROBIC METABOLISM DURING ACTIVITY IN THE RAINBOW TROUT *(SALMO GAIRDNERI). Experientia (Basel)* 39(12):1366-1367. 15 Dec. 1983. SFA 29(2)
[I.A. Johnston: Dep. Physiol. Pharmacol., Univ. St. Andrews, Bute Med. Bldg., St. Andrews KY16 9TS, Fife, Scotland] Rainbow trout 27 g b.wt were trained to swim in a water tunnel at 1.1 body lengths $\cdot sec^{-1}$ (10°C). Swimming speed was increased over 60 sec to either 2.3, 3.8, 5.3, 6.1 or 7.0 body lengths $\cdot sec^{-1}$ and fish were freeze clamped in liquid nitrogen. Other fish were sampled after a further 5 min steady swimming. Anaerobic energy production (mmoles $\cdot ATP \cdot kg^{-1}$ min^{-1}) calculated from whole body lactate concentrations increased from 0.23 at 2.3 body lengths sec^{-1} to 1.6 at 7.0 body lengths sec^{-1}. Lactate concentrations decreased for periods of swimming greater than 20 min partly due to a catabolism of lactate.

84-001080 Woo, N. Y. S. and R. S. S. Wu. CHANGES IN BIOCHEMICAL COMPOSITION IN THE RED GROUPER, *EPINEPHELUS AKAARA* (TEMMINCK AND SCHLEGEL), AND THE BLACK SEA BREAM, *MYLIO MACROCEPHALUS* (BASILEWSKY), DURING HYPOXIC EXPOSURE. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):475-482. 1984. SFA 29(2)
[Dep Biol., Chinese Univ. Hong Kong, Shatin, Hong Kong]

84-001081 Yamida, K.; S. Miyata and H. Katayama. AUTORADIOGRAPHIC DEMONSTRATION OF ADRENERGIC INNERVATION TO SCALE MELANOPHORES OF A TELEOST FISH, *ORYZIAS LATIPES. J. Exp. Zool.* 229(1):73-80. Jan. 1984. SFA 29(2)
[Zool. Inst., Fac. Sci., Hiroshima Univ., Hiroshima 730, Japan]

84-001082 Yoshinaka, R.; M. Sato; T. Suzuki and S. Ikeda. ENZYMATIC CHARACTERIZATION OF ANIONIC TRYPSIN OF THE CATFISH *(PARASILURUS ASOTUS). Comp. Biochem. Physiol. B Comp. Biochem.* 77(1):1-6. 1984. SFA 29(2)
[Dep. Fish., Fac. Agric., Kyoto Univ., Sakyoku, Kyoto 606, Japan]

84-001083 Youngson, A. F. and T. H. Simpson. CHANGES IN SERUM THYROXINE LEVELS DURING SMOLTING IN CAPTIVE AND WILD ATLANTIC SALMON, *SALMO SALAR* L. *J. Fish Biol.* 24(1):29-39. Jan. 1984. SFA 29(2)
[DAFS Mar. Lab., Victoria Rd., Aberdeen, Scotland]

84-001084 Zakon, H. H. and J. H. Meyer. PLASTICITY OF ELECTRORECEPTOR TUNING IN THE WEAKLY ELECTRIC FISH, *STERNOPYGUS DARIENSIS. J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 153(4):477-487. Dec. 1983. SFA 29(2)
[Dep. Zool., Patterson Lab., Univ. Tex., Austin 78712]

PHYSIOLOGY (CONTINUED)

84-001085 Zhukinskiy, V. N. and V. R. Alekseenko. SEMEN QUALITY IN COMMON CARP, *CYPRINUS CARPIO*, AND WHITE ARMUR, *CTENOPHARYNGODON IDELLA* (CYPRINIDAE), IN DIFFERENT PERIODS OF THE SPAWNING SEASON AND AS INFLUENCED BY EXTRACTION METHODS. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):124-133. 1983. SFA 29(2)
[Inst. Hydrobiol., Acad. Sci. Ukranian SSR, Kiev, USSR]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION

84-001086 Amemiya, C. T.; J. W. Bickham and J. R. Gold. A CELL CULTURE TECHNIQUE FOR CHROMOSOME PREPARATION IN CYPRINID FISHES. *Copeia* 1984(1):232-235. 23 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-001087 Angus, R. A. and R. J. Schultz. CLONAL DIVERSITY IN THE UNISEXUAL FISH *POECILIOPSIS MONACHA-LUCIDA*: A TISSUE GRAFT ANALYSIS. *Evolution* 33(1):27-40. Mar. 1979. SFA 29(2)
[Dep. Biol., Univ. Ala., Birmingham 35294]

84-001088 Avise, J. C. and J. Felley. POPULATION STRUCTURE OF FRESHWATER FISHES I. GENETIC VARIATION OF BLUEGILL (*LEPOMIS MACROCHIRUS*) POPULATIONS IN MAN-MADE RESERVOIRS. *Evolution* 33(1):15-26. Mar. 1979. SFA 29(2)
[Dep. Zool., Univ. Ga., Athens 30602]

84-001089 Baltz, D. M. and E. J. Loudenslager. ELECTROPHORETIC VARIATION AMONG SUBSPECIES OF TULE PERCH (*HYSTEROCARPUS TRASKI*). *Copeia* 1984(1):223-227. 23 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Sci., Univ. Calif., Davis 95616]

84-001090 Bell, M. A. and T. R. Haglund. SELECTIVE PREDATION OF THREESPINE STICKLEBACKS (*GASTEROSTEUS ACULEATUS*) BY GARTER SNAKES. *Evolution* 32(2):304-319. June 1978. SFA 29(2)
[Dep. Biol., Univ. Calif., Los Angeles 90024]

84-001091 Bell, M. A. DIFFERENTIATION OF ADJACENT STREAM POPULATIONS OF THREESPINE STICKLEBACKS. *Evolution* 36(1):189-199. Jan. 1982. SFA 29(2)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

84-001092 Benfey, T. J. and A. M. Sutterlin. TRIPLOIDY INDUCED BY HEAT SHOCK AND HYDROSTATIC PRESSURE IN LANDLOCKED ATLANTIC SALMON (*SALMO SALAR* L.). *Aquaculture* 36(4):359-367. 1 Feb. 1984. SFA 29(2)
[West Vancouver Lab., 4160 Marine Dr., West Vancouver, BC V7V 1N6, Canada] Heat shocks of 5 min at 32°C or hydrostatic pressure shocks of 3 or 6 min at 7.0 X 10^4 kPa (10 150 p.s.i.), when completed within 20 min of fertilization at 10°C, were found to induce 100% triploidy with 70-90% survival (relative to controls) in landlocked Atlantic salmon (*Salmo salar* L.). The identical heat shock yielded substantially lower numbers of triploids when applied 25 to 45 min after fertilization. Pressure shocks of longer duration (9 to 15 min at 7.0 X 10^4 kPa) or higher magnitude (6 min at 7.9 X 10^4 to 10.5 X 10^4 kPa) resulted in 100% mortality prior to hatching. Possible applications of these techniques to salmonid aquaculture are discussed.

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001093 Borowsky, R. THE TAILSPOT POLYMORPHISM OF *XIPHOPHORUS* (PISCES: POECILIIDAE). *Evolution* 32(4):886-893. Dec. 1978. SFA 29(2)
[Dep. Biol., N. Y. Univ., Washington Square, New York, NY 10003]

84-001094 Brown, K. L. DEMOGRAPHIC AND GENETIC CHARACTERISTICS OF DISPERSAL IN THE MOSQUITOFISH, *GAMBUSIA AFFINIS*. *Bull. Ecol. Soc. Am.* 64(2):105. June 1983. Abstract only. SFA 29(2)
[Wichita State Univ., Wichita, KS]

84-001095 Bulger, A. J. and R. J. Schultz. HETEROSIS AND INTERCLONAL VARIATION IN THERMAL TOLERANCE IN UNISEXUAL FISHES. *Evolution* 33(3):848-859. Sept. 1979. SFA 29(2)
[Biol. Sci. Group, Univ. Conn., Storrs 06268]

84-001096 Chingjiang, W. and J. H. Schröder. THE OCCURRENCE OF A REGULATORY MUTATION IN POSTIRRADIATION OFFSPRING OF CONVICT CICHLID FISH, *CICHLASOMA NIGROFASCIATUM* (PISCES, PERCIFORMES). *Biochem. Genet.* 21(11-12):1115-1120. Dec. 1983. SFA 29(2)
[Inst. Hydrobiol., Acad. Sin., Wuhan, China]

84-001097 Dotson, R. C. and J. E. Graves. BIOCHEMICAL IDENTIFICATION OF A BLUEFIN TUNA ESTABLISHES A NEW CALIFORNIA SIZE RECORD. *Calif. Fish Game* 70(1):62-64. Jan. 1984. SFA 29(2)
[NMFS, 8604 La Jolla Shores Dr., La Jolla, CA 92038]

84-001098 Douglas, M. E. and J. C. Avise. SPECIATION RATES AND MORPHOLOGICAL DIVERGENCE IN FISHES: TESTS OF GRADUAL VERSUS RECTANGULAR MODES OF EVOLUTIONARY CHANGE. *Evolution* 36(2):224-232. Mar. 1982. SFA 29(2)
[Bur. Biol. Res., Rutgers Univ., Piscataway, NJ 08854]

84-001099 Dunham, A. E.; G. R. Smith and J. N. Taylor. EVIDENCE FOR ECOLOGICAL CHARACTER DISPLACEMENT IN WESTERN AMERICAN CATOSTOMID FISHES. *Evolution* 33(3):877-896. Sept. 1979. SFA 29(2)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

84-001100 Endler, J. A. CONVERGENT AND DIVERGENT EFFECTS OF NATURAL SELECTION ON COLOR PATTERNS IN TWO FISH FAUNAS. *Evolution* 36(1):178-188. Jan. 1982. SFA 29(2)
[Dep. Biol., Univ. Utah, Salt Lake City 84112]

84-001101 Endler, J. A. NATURAL SELECTION ON COLOR PATTERNS IN *POECILIA RETICULATA*. *Evolution* 34(1):76-91. Jan. 1980. SFA 29(2)
[Dep. Biol., Univ. Utah, Salt Lake City 84112]

84-001102 Farr, J. A. THE INHERITANCE OF QUANTITATIVE FITNESS TRAITS IN GUPPIES, *POECILIA RETICULATA* (PISCES: POECILIIDAE). *Evolution* 37(6):1193-1209. Nov. 1983. SFA 29(2)
[Dep. Biol. Sci., Fla. State Univ., Tallahassee 32306]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001103 Feder, J. L.; M. H. Smith; R. K. Chesser; M. J. W. Godt and K. Asbury. BIOCHEMICAL GENETICS OF MOSQUITOFISH. II. DEMOGRAPHIC DIFFERENTIATION OF POPULATIONS IN A THERMALLY ALTERED RESERVOIR. *Copeia* 1984(1):108-119. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Mich. State Univ., East Lansing 48824] Mosquitofish (N = 7,580) from five sites along a thermal gradient in a reservoir were analyzed using eletrophoretic techniques. Each sample was genetically different from the other four and none was in Hardy-Weinberg equilibrium for all loci. The populations also differed in their sex ratios and size structures. Juveniles tended to be less heterozygous than adults and heterozygotes tended to have longer body lengths than homozygotes within sex-age classes as indicated by single locus tests. Overall heterozygosity was highest in the population from the hottest water and lowest in those populations from the coldest water. Distributions of fish with different numbers of heterozygous loci were similar among sex-age classes within locations but significantly different for males and juveniles across locations. While stochastic processes are important in determining some of the genetic variation of the mosquitofish populations, selection is the probable explanation for the body length-genotype correlations and for the differences in genotypic proportions between males, females and juveniles.

84-001104 Gold, J. R. SILVER-STAINING AND HETEROMORPHISM OF CHROMOSOMAL NUCLEOLUS ORGANIZER REGIONS IN NORTH AMERICAN CYPRINID FISHES. *Copeia* 1984(1):133-139. 23 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-001105 Graves, J. E. and R. H. Rosenblatt. GENETIC RELATIONSHIPS OF THE COLOR MORPHS OF THE SERRANID FISH *HYPOPLECTRUS UNICOLOR*. *Evolution* 34(2):240-245. Mar. 1980. SFA 29(2)
[Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

84-001106 Graves, J. E. and G. N. Somero. ELECTROPHORETIC AND FUNCTIONAL ENZYMIC EVOLUTION IN FOUR SPECIES OF EASTERN PACIFIC BARRACUDAS FROM DIFFERENT THERMAL ENVIRONMENTS. *Evolution* 36(1):97-106. Jan. 1982. SFA 29(2)
[Mar. Biol. Res. Div. (A-002), Scripps Inst. Oceanogr., Univ. Calif., La Jolla 92093]

84-001107 Grudzien, T. A. and B. J. Turner. GENIC IDENTITY AND GEOGRAPHIC DIFFERENTIATION OF TROPHICALLY DICHOTOMOUS *ILYODON* (TELEOSTEI: GOODEIDAE). *Copeia* 1984(1):102-107. 23 Feb. 1984. SFA 29(2)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

84-001108 Guest, W. C. PRELIMINARY OBSERVATIONS OF GROWTH, SURVIVAL, REPRODUCTIVE SUCCESS AND CATCHABILITY OF PARENTALS, HYBRID AND TRIHYBRID SUNFISHES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:15. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Fort Worth 76114]

84-001109 Hagen, D. W. and G. E. E. Moodie. POLYMORPHISM FOR BREEDING COLORS IN *GASTEROSTEUS ACULEATUS*. I. THEIR GENETICS AND GEOGRAPHIC DISTRIBUTION. *Evolution* 33(2):641-648. June 1979. SFA 29(2)
[Univ. New Brunswick, Fredericton, NB, Canada]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001110 Hagen, D. W.; G. E. E. Moodie and P. F. Moodie. POLYMORPHISM FOR BREEDING COLORS IN *GASTEROSTEUS ACULEATUS* II. REPRODUCTIVE SUCCESS AS A RESULT OF CONVERGENCE FOR THREAT DISPLAY. *Evolution* 34(6):1050-1059. Nov. 1980. SFA 29(2)
[Univ. New Brunswick, Fredericton, NB, Canada]

84-001111 Hume, D. J.; A. R. Fletcher and A. K. Morison. INTERSPECIFIC HYBRIDIZATION BETWEEN CARP (*CYPRINUS CARPIO* L.) AND GOLDFISH (*CARASSIUS AURATUS* L.) FROM VICTORIAN WATERS. *Aust. J. Mar. Freshwater Res.* 34(6):915-919. 1983. SFA 29(2)
[Fish. Wildl. Div., P.O. Box 41, East Melbourne, Victoria 3002, Australia]

84-001112 King, D. P. F. GENETIC ANALYSIS OF ENZYME POLYMORPHISMS IN HERRING (*CLUPEA HARENGUS* L.). *Heredity* 52(1):121-131. Feb. 1984. SFA 29(2)
[Dep. Agric. North. Ireland, Fish. Res. Lab., 38 Castleroe Rd., Coleraine, Co. Londonderry, Norther Ireland]

84-001113 Kobayashi, T.; G. B. Milner; D. J. Teel and F. M. Utter. GENETIC BASIS FOR ELECTROPHRETIC VARIATION OF ADENOSINE DEAMINASE IN CHINOOK SALMON. *Trans. Am. Fish. Soc.* 113(1):86-89. Jan. 1984. SFA 29(2)
[Hokkaido Reg. Fish. Res. Lab., Fish. Agency, 116 Katsurakoi Kushiro, Hokkaido 985, Japan]

84-001114 Koehn, R. K. and G. C. Williams. GENETIC DIFFERENTIATION WITHOUT ISOLATION IN THE AMERICAN EEL, *ANGUILLA ROSTRATA*. II. TEMPORAL STABILITY OF GEOGRAPHIC PATTERNS. *Evolution* 32(3):624-637. Sept. 1978. SFA 29(2)
[Dep. Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

84-001115 Kornfield, I. L.; U. Ritte; C. Richler and J. Wahrman. BIOCHEMICAL AND CYTOLOGICAL DIFFERENTIATION AMONG CICHLID FISHES OF THE SEA OF GALILEE. *Evolution* 33(1):1-14. March 1979. SFA 29(2)
[Dep. Zool., Univ. Me., Orono 04469]

84-001116 Leslie, J. F. and R. C. Vrijenhoek. CONSIDERATION OF MULLER'S RATCHET MECHANISM THROUGH STUDIES OF GENETIC LINKAGE AND GENOMIC COMPATIBILITIES IN CLONALLY REPRODUCING *POECILIOPSIS*. *Evolution* 34(6):1105-1115. Nov. 1980. SFA 29(2)
[Dep. Zool., Univ. Iowa, Iowa City 52242]

84-001117 Moore, W. S. and A. B. Eisenbrey. THE POPULATION STRUCTURE OF AN ASEXUAL VERTEBRATE, *POECILIOPSIS 2 MONACHA-LUCIDA* (PISCES: POECILIIDAE). *Evolution* 33(2):563-578. June 1979. SFA 29(2)
[Dep. Biol., Wayne State Univ., Detroit, MI 48202]

84-001118 Mork, J.; R. Giskeødegård and G. Sundnes. POPULATION GENETIC STUDIES IN COD (*GADUS MORHUA L.*) BY MEANS OF THE HAEMOGLOBIN POLYMORPHISM; OBSERVATIONS IN A NORWEGIAN COASTAL POPULATION. *Fiskeridir.*

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001118 CONTINUED *Skr. Ser. Havunders.* 17(12):449-471. 1984. SFA 29(2)
[Biol. Stn., Trondheim, Norway]

84-001119 Orzack, S. H.; J. J. Sohn; K. D. Kallman; S. A. Levin and R. Johnston. MAINTENANCE OF THE THREE SEX CHROMOSOME POLYMORPHISM IN THE PLATYFISH, *XIPHOPHORUS MACULATUS. Evolution* 34(4):663-672. July 1980. SFA 29(2)
[Mus. Comp. Zool., Harvard Univ., Cambridge, MA 02138]

84-001120 Pezold, F. EVIDENCE FOR MULTIPLE SEX CHROMOSOMES IN THE FRESHWATER GOBY, *GOBIONELLUS SHUFELDTI* (PISCES: GOBIIDAE). *Copeia* 1984(1):235-238. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Tex., Austin 78712]

84-001121 Philipp, D. P. GENETIC CONSERVATION AND FISHERIES MANAGEMENT. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:11-12. 1983. Abstract only. SFA 29(2)
[Ill. Nat. Hist. Surv., Champaign 61820]

84-001122 Reznick, D. and J. A. Endler. THE IMPACT OF PREDATION ON LIFE HISTORY EVOLUTION IN TRINIDADIAN GUPPIES (*POECILIA RETICULATA*). *Evolution* 36(1):160-177. Jan. 1982. SFA 29(2)
[Acad. Nat. Sci. Phila., Benedict Estuarine Res. Lab., Benedict, MD 20612]

84-001123 Stearns, S. C. and R. D. Sage. MALADAPTATION IN A MARGINAL POPULATION OF THE MOSQUITO FISH, *GAMBUSIA AFFINIS. Evolution* 34(1):65-75. Jan. 1980. SFA 29(2)
[Reed Coll., Portland, OR 97202]

84-001124 Taniguchi, N.; S. Seki and Y. Inada. [GENIC VARIABILITY AND DIFFERENTIATION OF AMPHIDROMOUS, LANDLOCKED, AND HATCHERY POPULATIONS OF AYU *PLECOGLOSSUS ALTIVELIS. Bull. Jpn. Soc. Sci. Fish.* 49(11):1655-1663. Nov. 1983. In Japanese with English summ. SFA 29(2)
[Dep. Cult. Fish., Fac. Agric., Kochi Univ., Nankoku, Kochi 783, Japan]

84-001125 Tave, D. GENETICS OF DORSAL FIN RAY NUMBER IN THE GUPPY, *POECILIA RETICULATA. Copeia* 1984(1):140-144. 23 Feb. 1984. SFA 29(2)
[Dep. Entomol. Fish. Wildl., Univ. Minn., St. Paul 55108]

84-001126 Thibault, R. E. ECOLOGICAL AND EVOLUTIONARY RELATIONSHIPS AMONG DIPLOID AND TRIPLOID UNISEXUAL FISHES ASSOCIATED WITH THE BISEXUAL SPECIES, *POECILIOPSIS LUCIDA* (CYPRINODONTIFORMES: POECILIIDAE). *Evolution* 32(3):613-623. Sept. 1978. SFA 29(2)
[Dep. Biol. Sci., Bowling Green State Univ., Bowling Green, OH 43403]

84-001127 Turner, B. J. and D. J. Grosse. TROPHIC DIFFERENTIATION IN *ILYODON*, A GENUS OF STREAM-DWELLING GOODEID FISHES: SPECIATION VERSUS ECOLOGICAL POLYMORPHISM. *Evolution* 34(2):259-270. Mar. 1980. SFA 29(2)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001128 Turner, B. J.; B.-L. H. Brett; E. M. Rasch and J. S. Balsano. EVOLUTIONARY GENETICS OF A GYNOGENETIC FISH, *POECILIA FORMOSA*, THE AMAZON MOLLY. *Evolution* 34(2):246-258. Mar. 1980. SFA 29(2)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

84-001129 Turner, B. J.; B.-L. H. Brett and R. R. Miller. INTERSPECIFIC HYBRIDIZATION AND THE EVOLUTIONARY ORIGIN OF A GYNOGENETIC FISH, *POECILIA FORMOSA*. *Evolution* 34(5):917-922. Sept. 1980. SFA 29(2)
[Dep. Biol., VPI & SU, Blacksburg, VA 24061]

84-001130 Vuorinen, J. REDUCTION OF GENETIC VARIABILITY IN A HATCHERY STOCK OF BROWN TROUT, *SALMO TRUTTA* L. *J. Fish Biol.* 24(3):339-348. Mar. 1984. SFA 29(2)
[Dep. Biol., Univ. Joensuu, Finland] Enzyme gene variability in a lake-dwelling brown trout, *Salmo trutta*, population was compared with its hatchery derivative by starch gel electrophoresis. A loss of genetic variability was detected in the hatchery stock founded 16 years ago in comparison to the present day wild stock; of seven originally polymorphic loci (Aat-4, CK-1, Gpi-3, G3p-2, Ldh-1, Mdh-2 and Pgm-1) two, Gpi-3 and Ldh-1, had become monomorphic. The overall heterozygosity was reduced by a third from 6.2% to 4.2%. A comparison between three successive hatchery chohorts indicates a distinction between stock heterogeneity. The decrease in genetic variability is probably attributable to small population size in the founding event with subsequent genetic drift and inadvertent selection during hatchery procedures.

84-001131 Wallis, G. P. and J. A. Beardmore. GENETIC VARIATION AND ENVIRONMENTAL HETEROGENEITY IN SOME CLOSELY RELATED GOBY SPECIES. *Genetica* 62(3):223-237. 15 Mar. 1984. SFA 29(2)
[Dep. Zool., Leicester Univ., Leicester LE1 7RH, U.K.]

84-001132 Warner, R. R. and S. G. Hoffman. LOCAL POPULATION SIZE AS A DETERMINANT OF MATING SYSTEM AND SEXUAL COMPOSITION IN TWO TROPICAL MARINE FISHES (*THALASSOMA* SPP.). *Evolution* 34(3):508-518. May 1980. SFA 29(2)
[Mar. Sci. Inst., Univ. Calif., Santa Barbara 93106]

84-001133 White, M. M. and B. J. Turner. MICROGEOGRAPHIC DIFFERENTIATION IN A STREAM POPULATION OF *GOODEA ATRIPINNIS* (GOODEIDAE) FROM THE MEXICAN PLATEAU. *Environ. Biol. Fishes* 10(1-2):123-127. 15 Feb. 1984. SFA 29(2)
[B.J. Turner: Dep. Biol., VPI&SU, Blacksburg, VA 24061]

84-001134 Winans, G. A. GEOGRAPHIC VARIATION IN THE MILKFISH *CHANOS CHANOS*. I. BIOCHEMICAL EVIDENCE. *Evolution* 34(3):558-574. May. 1980. SFA 29(2)
[Hawaii Inst. Mar. Biol., Univ. Hawaii, Honolulu 96822]

84-001135 Wishard, L. N.; J. E. Seeb; F. M. Utter and D. Stefan. A GENETIC INVESTIGATION OF SUSPECTED REDBAND TROUT POPULATIONS. *Copeia* 1984(1):120-132. 23 Feb. 1984. SFA 29(2)
[Fish. Res. Inst., Sch. Fish., Univ. Wash., Seattle 98195] Samples from eight populations of native (presumably "redband") trout in Idaho from tributaries of the Owyhee River and adjacent streams flowing into the Snake

GENETICS, VARIATION STUDIES AND HYBRIDIZATION (CONTINUED)

84-001135 CONTINUED River were analyzed by starch gel electrophoresis 1) to seek evidence of introgression from plantings of hatchery rainbow trout, 2) to determine the relationships among these populations, and 3) to identify the relationship of these populations to other "redband" trout from California, Nevada and Oregon. Average heterozygosities (range .048-.074) were well within the ranges reported for outbred rainbow trout populations suggesting that successions of severe "bottlenecks" had not occurred in these populations, in spite of the harsh environmental conditions. There was no evidence of hatchery introgression; rather, different measures indicated relationships based entirely on geographic variables with genetic similarity decreasing as linear stream distance increased. The native trout populations of Idaho were very similar to a population of native trout from Chino Creek, Nevada, in the Owyhee River drainage as well as to steelhead populations of the Snake River. Significant allelic frequency differences existed between the native Idaho populations and hatchery rainbow trout, coastal steelhead populations and "redband" trout native to southeastern Oregon and northeastern Califonria. Morphological and physiological similarities to the latter group were hypothesized to be due to convergent characters or symplesiomorphically inherited characters. It was recommended that the term "redband" trout be retained to describe non-anadromous populations of rainbow trout adapted to harsh, arid environments, but that the term not necessarily infer taxonomic relationships among such populations.

BEHAVIOR

84-001136 Bachman, R. A. FORAGING BEHAVIOR OF FREE-RANGING WILD AND HATCHERY BROWN TROUT IN A STREAM. *Trans. Am. Fish. Soc.* 113(1):1-32. Jan. 1984. SFA 29(2)
[Pa. Coop. Fish Wildl. Res. Unit, Pa. State Univ., University Park 16802]

84-001137 Blake, R. W. HOVERING PERFORMANCE OF A NEGATIVELY BUOYANT FISH. *Can. J. Zool.* 61(11):2629-2630. Nov. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

84-001138 Blake, R. W. SWIMMING IN THE ELECTRIC EELS AND KNIFEFISHES. *Can. J. Zool.* 61(6):1432-1441. June 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

84-001139 Bowen, S. H. DIFFERENTIAL HABITAT UTILIZATION BY SEXES OF *SAROTHERODON MOSSAMBICUS* IN LAKE VALENCIA, VENEZUELA: SIGNIFICANCE FOR FITNESS. *J. Fish Biol.* 24(1):115-121. Jan. 1984. SFA 29(2)
[Dep. Environ. Popul. Organ. Biol., Univ. Colo., Boulder 80309] Adult male and female *Sarotherodon mossambicus* in Lake Valencia, Venezuala select different littoral habitats. Males prefer areas with soft bottoms and high turbidity, while females favour areas with hard bottoms and low turbidity. Soft bottoms provide suitable sediment for male breeding site construction and high turbidity helps protect territorial males from visionally orientated predators, but the food available in this habitat is of poor quality and males feed relatively little. The hard bottom littoral provides food of superior quality and females feed in these areas. Condition factors are highest for subadult males, intermediate for adult females and lowest for adult males. Differential habitat utilization by sexes of *S. mossambicus* in Lake Valencia appears to contribute to individual fitness by providing males and females with specific requirements for reproduction.

BEHAVIOR (CONTINUED)

84-001140 Branchek, T. THE DEVELOPMENT OF PHOTORECEPTORS IN THE ZEBRAFISH, *BRACHYDANIO RERIO*. II. FUNCTION. *J. Comp. Neurol.* 224(1):116-122. 20 Mar. 1984. SFA 29(2)
[Inst. Molec. Biol., Univ. Oreg., Eugene 97403]

84-001141 Chapman, C. A. and W. C. Mackay. DIRECT OBSERVATION OF HABITAT UTILIZATION BY NORTHERN PIKE. *Copeia* 1984(1):255-258. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB, Canada]

84-001142 Churmasov, A. V.; M. Y. Ul'yanov and V. R. Protasov. A MECHANISM FOR FISH ORIENTATION DURING LONG-DISTANCE MIGRATIONS. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Acad. Nauk SSSR Ser. Biol.)* 270(1-6):348-351. Nov. 1983. SFA 29(2)
[A.H. Severtsov Inst. Evol. Morphol. Anim. Ecol., Acad. Sci. USSR, Moscow, USSR]

84-001143 Cincotta, D. A. and J. R. Stauffer, Jr. TEMPERATURE PREFERENCE AND AVOIDANCE STUDIES OF SIX NORTH AMERICAN FRESHWATER FISH SPECIES. *Hydrobiologia* 109(2):173-177. 17 Feb. 1984. SFA 29(2)
[W. Va. Dep. Nat. Resour., P.O. Box 67, Elkins 26241]

84-001144 Cunjak, R. A. and J. M. Green. HABITAT UTILIZATION BY BROOK CHAR (*SALVELINUS FONTINALIS*) AND RAINBOW TROUT (*SALMO GAIRDNERI*) IN NEWFOUNDLAND STREAMS. *Can. J. Zool.* 61(6):1214-1219. June 1983. SFA 29(2)
[J. M. Green: Mar. Sci. Res. Lab., Memorial Univ. Newfoundland, St. John's, NF A1B 3X9, Canada] Recent range extension of introduced salmonid species in insular Newfoundland has caused concern over their effects on native fish species. The present study was designed to investigate the stream habitat utilization of the exotic rainbow trout and the native brook char. Results of underwater field observations in a stream where the two species coexisted showed that brook char occupied positions with significantly lower water velocities and more cover than similar-sized rainbow trout. Brook char showed similar microhabitat preferences in a nearby stream where they were allopatric. The extent of species segregation was largely affected by local stream morphology, specifically the availability of preferred habitat. The implications for future introductions of exotic salmonids to native brook char streams are discussed.

84-001145 Fechhelm, R. G.; W. H. Neil and B. J. Gallaway. TEMPERATURE PREFERENCE OF JUVENILE ARCTIC CISCO (*COREGONUS AUTUMNALIS*) FROM THE ALASKAN BEAUFORT SEA. *Univ. Alaska Biol. Pap.* No. 21. p. 24-38. Dec. 1983. SFA 29(2)
[LGL Ecol. Res. Assoc., Inc., 1410 Cavitt St., Bryan, TX 77801] The temperature preferences of juvenile Arctic cisco, *Coregonus autumnalis*, were tested in a horizontal thermal gradient as a function of both acclimation temperature and salinity. Cisco preferred temperatures ranging from 11.5°C for fish acclimated to 5°C/5 ppt, to 15.4°C for fish acclimated to 15°C/15 ppt. Estimated final temperature preferenda were 13.5°C at 30 ppt and 15.6°C at 15 ppt. Preferred temperatures at 5 and 30 ppt were lower ($P<0.05$) than that at 15 ppt. Observations of fish in the acclimation tanks suggest that physiologically optimal temperatures of juvenile Arctic cisco genuinely exceed 10°C in the salinity range of 5-30 ppt. These results are consistent with the observed summer distributions of Arctic cisco in the

BEHAVIOR (CONTINUED)

84-001145 CONTINUED Alaskan Beaufort Sea: fish concentrate near shore in a narrow band of relatively warm, moderately saline water.

84-001146 Hoogerhoud, R. J. C.; F. Witte and C. D. N. Barel. THE ECOLOGICAL DIFFERENTIATION OF TWO CLOSELY RESEMBLING *HAPLOCHROMIS* SPECIES FROM LAKE VICTORIA (*H. IRIS* AND *H. HIATUS*; PISCES, CICHLIDAE). *Neth. J. Zool.* 33(3):283-305. Dec. 1983. SFA 29(2)
[Projectgroup Ecol. Morphol., Zool. Lab., Rijksuniv. Leiden, P.O. Box 9516, 2300 RA Leiden, The Netherlands]

84-001147 Jones, G. P. THE INFLUENCE OF HABITAT AND BEHAVIOURAL INTERACTIONS ON THE LOCAL DISTRIBUTION OF THE WRASSE, *PSEUDOLABRUS CELIDOTUS*. *Environ. Biol. Fishes* 10(1-2):43-58. 15 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Melbourne, Parkville 3052, Victoria, Australia]

84-001148 Karlsson, L.; G. Ekbohm and G. Steinholtz. COMMENTS ON A STUDY OF THE THERMAL BEHAVIOUR OF THE AMERICAN EEL (*ANGUILLA ROSTRATA*) AND SOME STATISTICAL SUGGESTIONS FOR TEMPERATURE PREFERENCE STUDIES. *Hydrobiologia* 109(1):75-78. 6 Feb. 1984. SFA 29(2)
[Inst. Zoophysiol., Univ. Uppsala, P.O. Box 560, S-751 22 Uppsala, Sweden] Some suggestions are made concerning methods and statistical evaluation of results in temperature preference studies. The use of regression analysis is advocated rather than graphical methods for evaluating results from acute temperature preference studies and a method of assessing the final preferendum and its confidence interval is demonstrated. This method is applied to a previously published study of the acutely preferred temperature of the American eel (Barila & Stauffer, 1980). The final preferendum and its 95% confidence interval is shown to be 17.4°±2.0°C. In direct contrast to conclusions there drawn, the preferred temperature is shown to depend on the acclimated temperature. Some critical comments are also made concerning other parts of the study.

84-001149 Marui, T.; S. Harada and Y. Kasahara. GUSTATORY SPECIFICITY FOR AMINO ACIDS IN THE FACIAL TASTE SYSTEM OF THE CARP, *CYPRINUS CARPIO* L. *J. Comp. Physiol. A Sens. Neural Behav. Physiol.* 153(3):299-308. Nov. 1983. SFA 29(2)
[Dep. Oral Physiol., Kagoshima Univ., Dental Sch., Usuki, Kagoshima 890, Japan]

84-001150 Marx, J.; R. Hilbig and H. Rahmann. ENDOTOXIN AND PROSTAGLANDIN E_1 FAIL TO INDUCE FEVER IN A TELEOST FISH. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(3):483-487. 1984. SFA 29(2)
[Zool. Inst., Univ. Stuttgart-Hohenheim, 7000 Stuttgart 70 (Hohenheim), West Germany]

84-001151 McNicol, R. E. and D. L. G. Noakes. ENVIRONMENTAL INFLUENCES ON TERRITORIALITY OF JUVENILE BROOK CHARR, *SALVELINUS FONTINALIS*, IN A STREAM ENVIRONMENT. *Environ. Biol. Fishes* 10(1-2):29-42. 15 Feb. 1984. SFA 29(2)
[Dep. Fish. Oceans, Freshwater Inst., Winnipeg, MB R3T 2N6, Canada]

BEHAVIOR (CONTINUED)

84-001152 Moyer, J. T. REPRODUCTIVE BEHAVIOR AND SOCIAL ORGANIZATION OF THE POMACANTHID FISH *GENICANTHUS LAMARCK* AT MACTAN ISLAND, PHILIPPINES. *Copeia* 1984(1):194-200. 23 Feb. 1984. SFA 29(2)
[Tatsuo Tanaka Mem. Biol. Stn., Miyake-Jima, Izu Islands 100-12, Japan]

84-001153 Nakamura, A. and T. Ishida. [MEASUREMENT OF YELLOWTAIL *SERIOLA QUINQUERADIATA* RESPONSE TO LIGHT AND SOUND STIMULI, USING ULTRASONIC HIGH SENSITIVITY TRANSMITTER WITH DEPTH FACTOR.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 17. p. 85-95. 1983. In Japanese with English summ. SFA 29(2)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

84-001154 New, J. G. and R. G. Northcutt. CENTRAL PROJECTIONS OF THE LATERAL LINE NERVES IN THE SHOVELNOSE STURGEON. *J. Comp. Neurol.* 225(1):129-140. 1 May 1984. SFA 29(2)
[Div. Biol. Sci., Univ. Mich., Ann Arbor 48109]

84-001155 Paszkowski, C. A. SURVIVORSHIP, GROWTH, AND INTERSPECIFIC INTERACTIONS AMONG FISH SPECIES IN A SMALL WISCONSIN LAKE: AN ENCLOSURE EXPERIMENT. *Bull. Ecol. Soc. Am.* 64(2):90. June 1983. Abstract only. SFA 29(2)
[Univ. Wis., Madison] The effects of intra- and interspecific interactions on growth and survivorship of central mudminnows, golden shiners, and yellow perch were examined by caging these species in a shallow seepage lake where they occurred naturally. Monospecific enclosures, containing 10 or 20 fish, and multispecific enclosures, containing 10 fish each of two species, were used. From July through October fishes were measured and weighed every 12 days. Initial densities were maintained by replacing mortalities. In all enclosures, all species lost weight in July and August, but enjoyed high survivorship and gained weight in September and October. Mudminnows and perch, both dietary generalists, displayed relatively similar growh-survivorship patterns and appeared more affected by intra- than interspecific interactions. Golden shiners, more specialized planktivores, were generally less successful in the enclosures and tended to grow less when caged with mudminnows or perch. These results have implications for the structure of small lake fish assemblages.

84-001156 Ryall, P. J. C. and B. T. Hargrave. ATTRACTION OF THE ATLANTIC WRECKFISH (*POLYPRION AMERICANUS*) TO AN UNBAITED CAMERA ON THE MID-ATLANTIC RIDGE. *Deep-Sea Res. A Oceanogr. Res. Pap.* 31(1):79-83. Jan. 1984. SFA 29(2)
[Dep. Geol., Dalhousie Univ., Halifax, NS B3H 3J5, Canada] Photographs of the Atlantic wreckfish *Polyprion americanus* were obtained with an unbaited camera lowered to the bottom between 445 and 740 m on a peak of the Crestal Mountains of the Mid-Atlantic Ridge. As many as four fish were visible in single photographs taken within 20 m of the bottom. Schooling and aggressive behaviour were suggested as *P. americanus* attacked the camera trip weight.

84-001157 Saglio, P. and J.-M. Blanc. ETUDE EN OLFACTOMÈTRE DE LA RÉPONSE COMPORTEMENTALE AUX L. ACIDES AMINÉS CHEZ LE JUVÉNILE DE CARPE, *CYPRINUS CARPIO* L. [OLFACTOMETRIC STUDY OF THE BEHAVIORAL RESPONSE TO L. AMINO ACIDS IN JUVENILE CARP, *CYPRINUS CARPIO* L.] *Biol. Behav.* 8(4):359-370. 1983. In French with English summ. SFA 29(2)
[Lab. Ecol. Poissons Amenage. Pêches, I.N.R.A. - Cent. Rech. Hydrobiol., B.P. 3, Saint-Pée-sur-Nivelle, F 64310 Ascain, France]

LIFE HISTORY-GENERAL WORKS

84-001158 Appa Rao, T. ON SOME ASPECTS OF FISHERY AND BIOLOGY OF SARDINES OF WALTAIR AREA. *Indian J. Fish.* 28(1-2):96-103. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Waltair, India]

84-001159 Appanna Sastry, Y. RIBBONFISH FISHERY OF KAKINADA DURING 1974-1976. *Indian J. Fish.* 27(1-2):145-154. 1980. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Kakinada, India]

84-001160 Bowering, W. R. AGE, GROWTH, AND SEXUAL MATURITY OF GREENLAND HALIBUT, *REINHARDTIUS HIPPOGLOSSOIDES* (WALBAUM), IN THE CANADIAN NORTHWEST ATLANTIC. *NOAA Fish. Bull.* 81(3):599-611. July 1983. SFA 29(2)
[Dep. Fish. Oceans, P.O. Box 5667, St. John's, NF A1C 5X1, Canada]

84-001161 Bur, M. T. GROWTH, REPRODUCTION, MORTALITY, DISTRIBUTION, AND BIOMASS OF FRESHWATER DRUM IN LAKE ERIE. *J. Great Lakes Res.* 10(1):48-58. 1984. SFA 29(2)
[U.S. FWS, Sandusky Biol. Stn., Sandusky, OH 44870] Predominant age-groups in the Lake Erie freshwater drum *Aplodinotus grunniens* population were 3, 4, and 5 as determined from gill net, trap net, bottom trawl, and midwater trawl samples. Age and growth calculations indicated that females grew faster than males. However, the length-weight relation did not differ between sexes and was described by the equation: log W = -5.4383 + 3.1987 log L. Some males became sexually mature at age 2 and all were mature by age 6. Females matured 1 year later than males. Three sizes of eggs were present in ovaries; the average total number was 127,000 per female for 20 females over a length range of 270 to 478 mm. Seasonal analysis of the ovary-body weight ratio indicated that spawning extended from June to August. A total annual mortality rate of 49% for drum aged 4 through 11 was derived from catch-curve analysis. Freshwater drum were widely distributed throughout Lake Erie in 1977-1979, the greatest concentration being in the western basin. They moved into warm, shallow water (less than 10 m deep) during summer, and returned to deeper water in late fall. Summer biomass estimates from the western basin, based on systematic surveys with bottom trawls, were 9,545 t in 1977 and 2,333 t in 1978.

84-001162 Clarke, T. A. ECOLOGY AND SEXUAL DIMORPHISM OF THE PELAGIC EEL, *STEMONIDIUM HYPOMELAS* (SERRIVOMERIDAE). *Copeia* 1984(1):249-252. 23 Feb. 1984. SFA 29(2)
[Dep. Oceanogr., P.O. Box 1346, Kaneohe, HI 96744]

84-001163 Daniels, R. A. and P. B. Moyle. LIFE HISTORY OF SPLITTAIL (CYPRINIDAE: *POGONICHTHYS MACROLEPIDOTUS*) IN THE SACRAMENTO-SAN JOAQUIN ESTUARY. *NOAA Fish. Bull.* 81(3):647-654. July 1983. SFA 29(2)
[N.Y. State Mus., Biol. Surv., Cult Educ. Cent., Room 3132, Albany 95616]

84-001164 De Silva, S. S.; P. Maitipe and R. T. Cumaranatunge. ASPECTS OF THE BIOLOGY OF THE EURYHALINE ASIAN CICHLID, *ETROPLUS SURATENSIS*. *Environ. Biol. Fishes* 10(1-2):77-87. 15 Feb. 1984. SFA 29(2)
[Dep. Zool., Ruhuna Univ. Coll., Matara, Sri Lanka] Aspects of the biology of the euryhaline Asian cichlid *Etroplus suratensis* in a coastal lagoon of Sri Lanka were studied for a period of 15 months. Comparisons are made from the catches from the fishery of manmade, inland freshwater reservoirs. Changes in the stock structure in the sublittoral region of the lagoon indicate that recruitment takes place twice a year,

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-001164 CONTINUED during the high rainfall/low salinity periods. The feeding habits of *E. suratensis* were different in the two habitats. In the lagoon it fed mainly on molluscs and in the freshwater reservoirs on macrophytes. Feeding chronology based on diurnal surveys indicate that it feeds mainly during the daylight hours. The dentition of *E. suratensis* is adapted for both tearing and crushing (pharyngeal teeth). Distinct differences in the mean relative intestinal length between populations from the coastal lagoon and inland reservoirs were evident and these differences are correlated to their respective feeding habits. Diurnal changes in feeding activity are associated with changes in the stomach pH. The egg-diameter distribution of mature fish indicate that *E. suratensis* is a single spawner, that it sheds its mature eggs all at once. It is inferred that *E. suratensis* breeds twice a year but that an individual female is capable of spawning only once a year.

84-001165 Gallaway, B.; P. Craig; W. Griffiths and J. Helmericks. AN ASSESSMENT OF STOCKS AND LIFE HISTORY OF THE ARCTIC CISCO IN THE BEAUFORT SEA. *Proc. Alaska Sci. Conf.* 33:159. 1982. Title only. SFA 29(2)
[LGL Alaska Research Assoc., Inc., P.O. Box 80607, Fairbanks 99708]

84-001166 George, M. K. BIOLOGY AND FISHERY OF WAM *MURAENESOX TALABONOIDES* (BLEEKER). *Indian J. Fish.* 27(1-2):82-94. 1980. SFA 29(2)
Medium sized Wam, *Muraenesox talabonoides* (Bleeker) belonging to 110.5-130.5 cm size groups dominated the offshore catch, while size groups, smaller and larger than these mainly contributed to the inshore catch due probably to gear selection. Small sciaenids (dhoma) appear to be the favoured food item of offshore wam. High incidence of empty stomachs was recorded in offshore wam. Significant deviation of sex ratio occured in wam larger than 135 cm. The length at first maturity in female is 120 cm and in male 105 cm. Fecundity varied in specimens of different length and significantly in specimens of the same length. Peak of spawning appears to be in May, followed by a possible secondary spawning around September. Spawning ground of wam may extend from Bombay to Kutch. Wam landings formed an average 7.5 per cent of the trawler catch. Catch and catch rate were the highest in the third quarter of all the years.

84-001167 Grove, D. J.; S. J. Gall; S. Waldron; T. Beech and H. Sidhu. O-GROUP FLOUNDER IN KINISH HARBOUR. *J. Sherkin Island* 1(2):82-85. 1981. SFA 29(2)
[Mar. Sci. Lab., Menai Bridge, Anglesey, Ireland]

84-001168 Haldorson, L. and P. Craig. LIFE HISTORY AND ECOLOGY OF A PACIFIC-ARCTIC POPULATION OF RAINBOW SMELT IN COASTAL WATERS OF THE BEAUFORT SEA. *Trans. Am. Fish. Soc.* 113(1):33-38. Jan. 1984. SFA 29(2)
[Sch. Fish. Sci., Univ. Alaska, Juneau 99801]

84-001169 James, P. S. B. R. and M. Badrudeen. BIOLOGY AND FISHERY OF SILVERBELLY *LEIOGNATHUS DUSSUMIEREI* (VALENCIENNES) FROM GULF OF MANNAR. *Indian J. Fish.* 28(1-2):154-182. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin, India]

84-001170 Kipling, C. SOME OBSERVATIONS ON AUTUMN-SPAWNING CHARR, *SALVELINUS ALPINUS* L., IN WINDERMERE, 1939-1982. *J. Fish Biol.* 24(2):229-234. Feb. 1984. SFA 29(2)

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-001170 CONTINUED
[Freshwater Biol. Assoc., Ambleside, Cumbria, England] Every year from 1939 to 1982 autumn-spawning charr, *Salvelinus alpinus* L., have been monitored in the north basin of Lake Windermere. Gillnets of mesh 32 mm bar were used. Up to 1974 the nets were set in Low Wray Bay, but, because of interference by the public, from 1975 they have been set at Thompson Holme, a less accessible site. The results from the two sites are not directly comparable. The main spawning time is November, and catch per unit effort (net day) in November has been calculated. From 1944 to 1974 the catch per unit effort showed an increasing trend, and from 1975 to 1982 it has been relatively stable. Growth was similar in the 1940s and 1970s. It is suggested that the increase in numbers of charr could be due to reduced predation by pike.

84-001171 Mohr, L. C. THE GENERAL ECOLOGY OF THE SLIMY SCULPIN (*COTTUS COGNATUS*) IN LAKE 302 OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1227. iv + 16p. Feb. 1984. In English with French summ. SFA 29(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada] The general ecology of the slimy sculpin (*Cottus cognatus*) from Lake 302 of the Experimental Lakes Area, Ontario was studied during the openwater season of 1982. The largest sculpin caught was 111 mm in length, weighed 16.86 grams and was aged 6+. Length-weight relationships were similar for both male and female sculpins. Condition was higher in males than in females with both sexes peaking in condition in June and declining throughout the summer. Growth was best for sculpins aged 0+ to 2+, averaging 22.7 mm per year. The population as a whole had a survival rate of 36%. Sculpins of both sexes matured at age 2+ and were 65-70 mm in length. They spawned in late May with fry hatching in late June. Chironomids and chaoborids were the most common food items used by sculpins (66% and 41%, respectively) during the spring and summer. In the fall these were replaced by young cyprinids and other larger prey species. Sculpins tended to congregate in the metalimnion of the lake where optimal oxygen concentrations and temperatures occurred.

84-001172 Muthiah, C. STUDY ON THE BIOLOGY OF *JOHNIEOPS VOGLERI* (BLEEKER) OF BOMBAY WATERS. *Indian J. Fish.* 29(1-2):118-133. 1982 SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Mangalore, India] *Johnieops vogleri* in Bombay waters attains an average size of 158 mm, 240 mm and 290 mm at the end of 1, 2 and 3 years as shown by the length-frequency method, and 164.4, 220.6 and 276.6 mm as indicated by the scales. The time of annulus formation in the scales was during May to September which coincides with low intensity of feeding, spawning activities of the fish and the prevailing monsoon. Juveniles prefer crustaceans and, as they grow, show the piscivorous tendency. Lower intensity of feeding is noticed during the spawning season. Fifty percent of the fish mature at 159 mm in length. The relative condition of the fish is correlated to the spawning activities. Fecundity varied from 26,028 to 581,298 eggs. The distribution of sexes observed during different months of the year is not significant except during October and November. Among 130-179 mm size groups, males preponderated, whereas females were more among 220-249 mm size groups.

84-001173 Neil, S. J. FIELD STUDIES OF THE BEHAVIORAL ECOLOGY AND AGONISTIC BEHAVIOR OF *CICHLASOMA MEEKI* (PISCES: CICHLIDAE). *Environ. Biol. Fishes* 10(1-2):59-68. 15 Feb. 1984. SFA 29(2)
[Dep. Zool., Queen's Univ. Belfast, Belfast BT7 1NN, Northern Ireland] The behavior and ecology of the firemouth cichlid were investigated in southern Mexico. Observations were conducted primarily at Laguna Bacalar,

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-001173 CONTINUED Quintana Roo. The fish bred throughout the year, nesting in small rocky crevices. Territories were established either by wandering pairs or by lone males which subsequently attracted mates. Stationary territories were maintained for two to three weeks by both pair members until the young were free-swimming, after which the parents defended the young as they foraged. Brood care lasted approximately three months. The distances at which fish were attacked and the behavior performed varied with the age of the defended young and the sex of the parent, as well as the species and size of the intruder. The sexes differed in their reproductive and agonistic activities. Predation on young was rapid if the parents were diverted from their defense. Serious injuries to adults were not observed to result from intraspecific contests. Such interactions were very common, but were ritualized with physical contact between animals rare. Color patterning varied with breeding interval, sex and behavior.

84-001174 Pfeiler, E. INSHORE MIGRATION, SEASONAL DISTRIBUTION AND SIZES OF LARVAL BONEFISH, *ALBULA*, IN THE GULF OF CALIFORNIA. *Environ. Biol. Fishes* 10(1-2):117-122. 15 Feb. 1984. SFA 29(2)

[Inst. Tecnol., Estud. Super. Monterey, Esc. Cienc. Marit. Alimentarias, Apt. Post. 484, Guaymas, Sonora 85400, Mexico] The leptocephalous larval stages of the bonefish (Albulidae: *Albula*) are abundant in the coastal regions and hypersaline lagoons (esteros) throughout the Gulf of California during winter and spring. Inshore movements of leptocephali were studied by sampling the entrance to Estero Miramar, at Guaymas, Sonora, Mexico, from February to May, 1981. Thirty-three samples were taken at various times during flood tide. All but four of the samples were taken after sunset. Leptocephali were collected in all months except May. The results suggest that leptocephali enter the estero only during the first few hours of flood tide. Large numbers of larvae were observed during the day at ebb tide maintaining their near-shore position in the entrance channel. These larvae did not appear to be migrating into the estero. This, together with the absence of larvae in daytime samples, suggests that the migration is nocturnal. Most of the 667 leptocephali collected during the sampling period had completed larval growth or were just beginning the metamorphic interval. The median standard length (SL) was 61 mm and the mode was 62 mm. The largest leptocephali measured 71 mm SL. Since metamorphosis is accompanied by a decrease in length, it was concluded that the maximum size attained during larval growth is about 71 mm SL.

84-001175 Richter, H.-J. THE CLOWN KILLIFISH, *EPIPLATYS ANNULATUS*. *Trop. Fish Hobbyist* 32(7):14-17. Mar. 1984. SFA 29(2)

84-001176 Snelson, F. F., Jr.; T. J. Mulligan and S. E. Williams. FOOD HABITS, OCCURRENCE, AND POPULATION STRUCTURE OF THE BULL SHARK, *CARCHARHINUS LEUCAS*, IN FLORIDA COASTAL LAGOONS. *Bull. Mar. Sci.* 34(1):71-80. Jan. 1984. SFA 29(2)

[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816] The bull shark, *Carcharhinus leucas*, is the most common shark in the brackish Indian River lagoon system on the central east coast of Florida. The biology of the lagoon population was studied between May 1975 and May 1979. There was substantial spatial and seasonal variation in catch rates with gill nets. Bull sharks were usually most abundant in the low-salinity lagoon basins. Catch rates were generally highest in the spring and fall and were always higher at night than day. No specimens were netted during the winter

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-001176 CONTINUED although bull sharks are known to be present during that season. The permanent lagoon population was composed entirely of newborn young and juveniles up to 202 cm TL. As they approach maturity, the subadults leave the estuary. Pregnant adult females return to lagoon waters in late spring and summer to give birth. One pregnant female 249 cm TL was captured during this study. Juvenile bull sharks in the lagoon system fed primarily on stingrays and marine catfishes.

84-001177 Sriramachandra Murty, V. OBSERVATIONS ON SOME ASPECTS OF BIOLOGY OF THREADFIN BREAM *NEMIPTERUS MESOPRION* (BLEEKER) FROM KAKINADA. *Indian J. Fish.* 28(1-2):199-207. 1981. SFA 29(2)

[Cent. Mar. Fish. Res. Inst., Kakinada, India] The length-weight relationship of *N. mesoprion* can be described by the equation log W = -4.6509.1 + 2.877071 log L. Females attain first maturity at a length of 100 mm. This species is a fractional spawner, releasing the ripe ova in two spawning acts during the single spawning season: December-April. It is estimated that the species attains 140, 185 and 205 mm at the completion of first, second and third years, respectively. The estimated growth parameters are: L_∞ = 219 mm, K = 0.83248 and t_o = -0.256198 years.

84-001178 Sriramachandra Murty, V. OBSERVATIONS ON SOME ASPECTS OF BIOLOGY OF THE BLACK CROAKER *ATROBUCCA NIBE* (JORDAN AND THOMPSON) FROM KAKINADA. *Indian J. Fish.* 27(1-2):66-75. 1980. SFA 29(2)

[Cent. Mar. Fish. Res. Inst. Cent., Kakinada, India] Observations on some aspects of biology of *Atrobucca nibe* are made from Kakinada. The length-weight relationship is described by the equation log W = -5.524308 + 3.213476 log L. The fluctuations in relative condition factor appear to be associated with fluctuations in gonad cycle. Individuals release ova in two batches during the spawning season which extends from February to July in the area. The length at first maturity is estimated at 145 mm. The sex ratio indicates predominance of males in most months and length groups.

84-001179 Sturm, M. G. de L. ON THE BIOLOGY OF THE CATFISH *CHRYSICHTHYS AURATUS* (GEOFFORY) IN THE MAN-MADE TIGA LAKE IN NORTHERN NIGERIA. *Freshwater Biol.* 14(1):43-51. Feb. 1984. SFA 29(2)

[Dep. Biol. Sci., Bayero Univ., P.M.B. 3011, Kano, Nigeria] A study was made of the biology of *Chrysichthys auratus*, a bottom-feeding omnivore, in Tiga Lake, a man-made lake in Northern Nigeria. Ripe females were present from April to September, coinciding with the hot season and rise in water level. First spawning took place at age II in females. No ripe males were found, and this was attributed to their spatial separation. Absolute fecundity was related to length and ranged from 327 to 1466 in forty-six females. Hyaline rings on the centra of lumbar vertebrae were counted to age 235 fish. The first ring is laid down at the end of the second year, after which the rings were formed annually, probably during the breeding season. The fish live for up to 6 years. There is a good fit of the growth curve to the von Bertalanffy equation. Growth is slow and a smaller maximum size is attained than in rivers.

84-001180 Suzuki, K.; S. Hioki and H. Kitazawa. [SPAWNING AND LIFE HISTORY OF *TRIACANTHUS BIACULEATUS* (PISCES: TRIACANTHIDAE) IN AN AQUARIUM.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 17. p. 131-138. 1983. In Japaneses with English summ. SFA 29(2)

[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

LIFE HISTORY-GENERAL WORKS (CONTINUED)

84-001181 Turner, J. S. and F. F. Snelson, Jr. POPULATION STRUCTURE, REPRODUCTION AND LABORATORY BEHAVIOR OF THE INTRODUCED *BELONESOX BELIZANUS* (POECILIIDAE) IN FLORIDA. *Environ. Biol. Fishes* 10(1-2):89-100. 15 Feb. 1984. SFA 29(2)
[Math/Sci. Div., Seminole Commun. Coll., Sanford, FL 32771]

84-001182 Vinci, G. K. THREADFIN BREAM (*NEMIPTERUS*) RESOURCES ALONG THE KERALA COAST WITH NOTES ON BIOLOGY OF *NEMIPTERUS JAPONICUS*. *Indian J. Fish.* 29(1-2):37-49. 1982. SFA 29(2)
[Cent. Inland Fish. Res. Inst., Barrackpore, 743101, India]

84-001183 Weiss-Glanz, L. S. and J. G. Stanley. POPULATION STRUCTURE INDICES OF LARGEMOUTH BASS AND SMALLMOUTH BASS DETERMINED FROM ANGLER CATCHES. *N. Am. J. Fish. Manage.* 4(1):89-98. 1984. SFA 29(2)
[Me. Coop. Fish. Res. Unit, 313 Murray Hall, Univ. Me., Orono 04469]

84-001184 Williams, V. R. and T. A. Clarke. REPRODUCTION, GROWTH, AND OTHER ASPECTS OF THE BIOLOGY OF THE GOLD SPOT HERRING, *HERKLOTSICHTHYS QUADRIMACULATUS* (CLUPEIDAE), A RECENT INTRODUCTION TO HAWAII. *NOAA Fish. Bull.* 81(3):587-597. July 1983. SFA 29(2)
[T. A. Clarke: Hawaii Inst. Mar. Biol., Univ. Hawaii, P.O. Box 1346, Kaneohe 96744-1346] The gold spot herring, *Herklotsichthys quadrimaculatus*, was introduced to Hawaii by unknown means probably in the early 1970s and apparently spread and increased in abundance very rapidly. On the island of Oahu, it has been regularly present in inshore areas since 1976 and has been most abundant during late spring to early fall. Among adult fishes sampled, females slightly outnumbered males in seine collections by day in shallow water, but males predominated in nighttime collections from deeper water. Both sexes began to mature at 75-80 mm SL and females carried distinct size groups of nearly mature ova by 90 mm SL. Gonad to somatic weight ratios from both sexes indicated a spring-to-fall spawning season with a midsummer peak. Batch fecundity of females was 1,100-6,300. There was no direct evidence of multiple spawning, but secondary size groups of small ova were observed in some females which also carried a distinct batch of larger ova. Holding experiments showed that juveniles deposit daily growth incerements on sagittae. Age estimates from increment counts of fish 17-121 mm long indicated that herring metamorphose at about 1 month, mature at 5-6 months, and probably live no more than 1 year. The reproductive life span of females appears long enough to ripen more than one batch of ova.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC.

84-001185 Allen, L. G. and E. E. DeMartini. TEMPORAL AND SPATIAL PATTERNS OF NEARSHORE DISTRIBUTION AND ABUNDANCE OF THE PELAGIC FISHES OFF SAN ONOFRE-OCEANSIDE, CALIFORNIA. *NOAA Fish. Bull.* 81(3):569-586. July 1983. SFA 29(2)
[Dep. Biol., Calif. State Univ., Northridge 91330]

84-001186 Bakkala, R. G. and L.-L. Low, (eds.). CONDITION OF GROUNDFISH RESOURCES OF THE EASTERN BERING SEA AND ALEUTIEN ISLANDS REGION IN 1982. *NOAA Tech. Mem. NMFS F/NWC* 42. v + 187p. 1983. From Monthy Catalog of

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001186 CONTINUED U.S. Government Publications, Jan. 1984, p. 59. SFA 29(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-001187 Carl, L. M. DENSITY, GROWTH, AND CHANGE IN DENSITY OF COHO SALMON AND RAINBOW TROUT IN THREE LAKE MICHIGAN TRIBUTARIES. *Can. J. Zool.* 61(5):1120-1127. May 1983. In English with French summ. SFA 29(2)
[Energy Nat. Resour., Fish Wildl. Div., 8th Floor South Tower, Petroleum Plaza, 9915-108 Street, Edmonton, AB T5K 2C9, Canada] Coho salmon spawning peaked in the late fall. Spawning densities ranged from fewer than 5 coho salmon per hectare up to 90 fish per hectare. Subyearling coho salmon densities ranged from 10 to 60 fish per 100 m^2 in June and dropped to 5-20 fish by early fall. Coho salmon fry increased in length from 40 mm in early May, to over 120 mm by smolt out-migration in the following April. Coho salmon instantaneous daily change in density coefficients ranged from 0.004 to 0.019 and were dependent on initial coho density. Daily coho salmon growth rates ranged from 0.38 to 0.60 mm per day and were not dependent on initial coho salmon density. Downstream movement of rainbow trout fry began in May, and continued into July. In the spring 10-20 yearlings and one to five 2-year-olds per 100 m^2 were present. Most fry emerged in June at a size of 25 mm and grew to 85 mm by fall. Daily growth rates varied from 0.23 to 0.45 mm per day for yearling rainbow trout and were not correlated with rainbow trout density.

84-001188 Chester, A. J.; G. R. Huntsman; P. A. Tester and C. S. Manooch III. SOUTH ATLANTIC BIGHT REEF FISH COMMUNITIES AS REPRESENTED IN HOOK-AND-LINE CATCHES. *Bull. Mar. Sci.* 34(2):267-279. Mar. 1984. SFA 29(2)
[NMFS, Southeast Fish. Cent., Beaufort Lab., Beaufort, NC 28516-9722]

84-001189 Conrad, R. H. MANAGEMENT APPLICATIONS OF SCALE PATTERN ANALYSIS METHODS FOR THE SOCKEYE SALMON RUNS TO CHIGNIK, ALASKA. *Alaska Dep. Fish Game Inf. Leafl.* No. 233. x + 185p. Jan. 1984. SFA 29(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

84-001190 Dan, S. S. MORTALITY RATES AND YIELD PER RECRUIT OF CATFISH *TACHYSURUS TENUISPINIS* (DAY). *Indian J. Fish.* 28(1-2):41-46. 1981. SFA 29(2)
[Waltair Res. Cent., Cent. Mar. Fish. Res. Inst., Waltair, India] The mortality rates and yield per recruit of the catfish, *Tachysurus tenuispinis* are estimated from mean sizes and age composition. The total instantaneous mortality rate ranges between 0.80 and 1.10. The natural mortality (M) was 0.51. The yield per recruit YW/R was maximum when F = 0.3. As the fishing mortality (F) already generated is considerable, caution is indicated against steping up the fishing effort any further to increase the catch of this species.

84-001191 Elliott, J. M. NUMERICAL CHANGES AND POPULATION REGULATION IN YOUNG MIGRATORY TROUT *SALMO TRUTTA* IN A LAKE DISTRICT STREAM, 1966-83. *J. Anim. Ecol.* 53(1):327-350. Feb. 1984. SFA 29(2)
[Freshwater Biol. Assoc., Windermere Lab., Ambleside, Cumbria, England] This 18-year study of numerical changes in a trout population is part of a general study on the population dynamics, growth and distribution of

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001191 CONTINUED migratory trout, *Salmo trutta* L., in Black Brows Beck, a stony stream in the English Lake District. Earliest and latest spawning dates were 3 November and 7 December; larger females spawned earlier than smaller females. Eggs per redd and mean egg weight increased with female size and decreased with time from the start of the pswaning period. Migratory trout produced more and larger eggs per unit length of fish than did resident trout in a neighbouring stream. In laboratory and stream experiments, 50% of eggs hatched and 50% of alevins emerged after 444° days and 852° days from fertilization, respectively. Egg weight positively affected alevin size at hatching and emergence from the gravel, but not development times. Survival times of newly-emerged fish kept in the laboratory without food were positively related to weight at emergence. Population densities of eggs and alevins were very similar within but differed between year-classes (range: 12-133 eggs m^{-2}). The dominant factor affecting population densities of young trout was the population density of eggs, and hence alevins, at the start of each year-class. Alevin emergence time, weight of eggs or alevins, water temperature, numbers of older trout and numbers of other fish species (chiefly *Cottus gobio* L.) had no obvious effect. The number of recruits to each year-class was related to the initial egg density by the Ricker, dome-shaped, stock-recruitment curve. Maximum recruitment has estimated as 7.2 fish m^{-2} (95% CL = 6.5-8.0) soon after the fry stage ended in May/early June and 2.0 (±0.5) fish m^{-2} in late August/September. Optimum egg densities for these values were estimated as 40.0 m^{-2} (95% CL = 38.5-41.7) and 62.5 m^{-2} (55.6-71.4) respectively. Mortality was very low for eggs land alevins but high for young trout trying to establish feeding territories. The instantaneous mortality rate was linearly related to egg density and hence was density-dependent. The mortality rate for June to August was also negatively related to, and appeared to compensate for, the high mortality rate in May/early June. Changes in population density are discussed in relation to four obvious extrinsic factors (temperature, water velocity, food and space) and two groups of intrinsic factors (fecundity/egg size and density-dependent mortality). Density-dependent mortality appeared to be the chief mechanism for population regulation of the young trout.

84-001192 Findley, J. S. and M. T. Findley. PACIFIC BUTTERFLY FISH COMMUNITIES: ARE THEY INTERACTIVE ASSEMBLAGES? *Bull. Ecol. Soc. Am.* 64(2):91. June 1983. Abstract only. SFA 29(2)
[Univ. N. Mex., Albuquerque]

84-001193 Gallaway, B. J.; W. B. Griffiths; P. C. Craig; W. J. Gazey and J. W. Helmericks. AN ASSESSMENT OF THE COLVILLE RIVER DELTA STOCK OF ARCTIC CISCO--MIGRANTS FROM CANADA? *Univ. Alaska Biol. Pap.* No. 21. p. 4-23. Dec. 1983. SFA 29(2)
[LGL Ecol. Res. Assoc., Inc., 1410 Cavitt St., Bryan, TX 77801]

84-001194 Gardiner, W. R. ESTIMATING POPULATION DENSITIES OF SALMONIDS IN DEEP WATER IN STREAMS. *J. Fish Biol.* 24(1):41-49. Jan. 1984. SFA 29(2)
[Freshwater Fish. Lab., Pitlochry, Perthshire, Scotland] Densities of salmon, trout and grayling were assessed in Scottish streams by systematic counting by underwater observers, where the water was greater than 1m deep, and by using electrofishing equipment in adjacent shallower areas. Tests of the efficiencies of the two methods are described. Applications have included the estimation of production of trout, grayling and young salmon at a site on the River Tay and predicting the salmon smolt run of the River Tilt, and these applications are briefly described. The most suitable period for visual counting was summer, as at water temperatures of less than 15°C fish were hiding among stones in the stream bed. Wet weather hampered both electrofishing and visual counting.

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001195 Garrod, D. J. ON THE VARIABILITY OF YEAR-CLASS STRENGTH. *J. Cons. Cons. Inst. Explor. Mer* 41(1):63-66. Oct. 1983. SFA 29(2)
[Fish. Lab., Lowestoft, Suffolk NR33 0HT, England] The Shepherd stock and recruitment model (Shepherd, 1982) has been fitted to data from a number of stocks (Garrod, 1982). This note describes the statistical characteristics of the residual variation of data points from the fitted model to investigate the form of the distribution of year-class strength and to detect any trend in the variance of year-class strength with stock size.

84-001196 Halyk, L. C. and E. K. Balon. STRUCTURE AND ECOLOGICAL PRODUCTION OF THE FISH TAXOCENE OF A SMALL FLOODPLAIN SYSTEM. *Can. J. Zool.* 61(11):2446-2464. Nov. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Guelph, Guelph, ON N1G 2W1, Canada] Fish species richness in floodplain pools results from species addition by spring invasion from the stream and species subtraction by local extinction throughout the summer. Local extinction is the more important of the two components. Nineteen floodplain pools (1 to 597 m^2) and an adjacent section of Irvine Creek (43°44'N, 80°25'W), Ontario, Canada, were treated with a piscicide to test if the pools contribute significantly to the resource potential of the river basin. Altogether, 41 626 fishes of 20 species were collected. Number of days of stream connection in the spring was not significantly correlated with fish species richness in the pools ($P < 0.10$). A significant correlation ($P < 0.05$, $r = 0.7413$) was found between species richness and the logarithm of pool area. The total fish production for the Irvine Creek section, adjusted to account for dominant and nondominant species, was 298 $kg \cdot ha^{-1} \cdot year^{-1}$. Production for this site was underestimated by 49% when weights and densities were backcalculated to time of annulus formation. Total production estimates of the floodplain pools ranged from 135 to 314 $kg \cdot ha^{-1} \cdot year^{-1}$. Stream connection duration affects pool fish production by regulating accessibility to the young of stream spawning species. Floodplain pools are beneficial to the Irvine Creek system. As nursery areas, floodplain pools produce fish biomass which can return to the stream during periods of stream-pool connection. These pools may also act as fish havens if catastrophic stream mortality occurs.

84-001197 Hara, I. ESTIMATION OF FISH DENSITY USING THE LINE INTERCEPT METHOD. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1619-1625. Nov. 1983. SFA 29(2)
[Tokai Reg. Fish. Res. Lab., Kochidoki, Chuo-ku, Tokyo 104, Japan]

84-001198 Isakson, J. S. and P. H. Pie. SOCKEYE SALMON SMOLT AND FRY OUTMIGRATIONS NEWHALEN RIVER, ALASKA SPRING-SUMMER 1983. *Proc. Alaska Sci. Conf.* 34:115. 1983. Abstract only. SFA 29(2)
[Dames & Moore, 155 N.E. 100th Street, Suite 500, Seattle, WA 98125]

84-001199 Jiwu, L.; L. Bingzheng and H. Songfang. [STUDIES ON THE POPULATION OF THE HAIRTAIL, *TRICHIURUS HAUMELA* (FORSKÅL), IN THE REGION OF THE TAIWAN BANK.] *Oceanol. Limnol. Sin.* 14(4):377-387. 1983. In Chinese with English summ. SFA 29(2)
[Inst. Oceanol., Acad. Sin., China]

84-001200 Jones, J. D. and G. Thomason. U.S./CANADA SALMON STOCK INTERCEPTION RESEARCH SOUTHERN SOUTHEASTERN ALASKA PINK SALMON (*ONCORHYNCHUS GORBUSCHA*) TAGGING STUDY, 1982. *Alaska Dep. Fish Game*

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001200 CONTINUED *Inf. Leafl.* No. 231. iii + 12p. Jan. 1984. SFA 29(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

84-001201 Jones, R. AN INVESTIGATION OF NORTH SEA HADDOCK (*MELANOGRAMMUS AEGLEFINUS*) LENGTH-AT-AGE DATA, WITH PARTICULAR REFERENCE TO THE EFFECTS ON GROWTH OF THE OUTSTANDING YEAR CLASSES OF 1962 AND 1967. *J. Cons. Cons. Inst. Explor. Mer* 41(1):50-62. Oct. 1983. SFA 29(2)
[Mar. Lab., P.O. Box 101, Victoria Rd., Aberdeen AB9 8DB, Scotland] This paper investigates the growth of North Sea haddock with particular reference to the growth of the very strong year classes of 1962 and 1967. Lengths at age and growth rates were investigated with particular reference to these two strong year classes and to those that were produced immediately before and immediately after them. The results show that: 1. The very good year classes of 1962 and 1967 as well as those of 1963 and 1968 which immediately followed them exhibited smaller lengths at age than those of 1961 and 1966. This appeared to be primarily owing to a reduction in growth rate after the fish became demersal, and prior to the attainment of a length of about 28 cm. Prior to the attainment of about 28 cm in length the growth rates of the two strong year classes as well as those of the two year classes which immediately followed them, were as low as those observed during the late 1920s. Once these year classes had attained about 29 cm in length, however, growth rates were maintained at a level comparable to that determined for the 1950s, which was greater than that determined for the late 1920s. 2. In the long term, there has been an increase in mean lengths at age, and the lengths at age of the 1961 and 1966 year classes which immediately preceded the 1962 and 1967 year classes were amongst the highest recorded since sampling began in the 1920s. 3. During the late 1960s, due to the appearance of the 1962 and 1967 year classes, the biomass of the stock increased by about four to seven fold over nearly a decade. In spite of this, the growth rates for haddock greater than about 28 cm in length were not lower during the 1960s than they were during the 1950s, and they were higher than those during the 1920s. The results suggest that if the strong year classes caused intraspecific competition for food, the effect was felt primarily by individuals of the same age or younger. Older and larger individuals appear to have been scarcely affected, if at all. 4. Although larger haddock eat larger food particles, there was found to be a very considerable overlap of food particle size in the diets of fish of different sizes. Based on stomach content analysis, the opportunity for intraspecific competition between fish of different sizes would appear to be very high. The different responses, to changesin biomass, of fish of different sizes, are therefore presumably owing to intraspecific differences in the relative success of food gathering, rather than to differences in the food available for fish of different sizes.

84-001202 Jordahl, D. COMPARISON OF BROOK TROUT POPULATIONS IN AN ACIDIC AND CIRCUMNEUTRAL STREAM. *Proc. W. Va. Acad. Sci.* 56(1):5. 1984. Abstract only. SFA 29(2)
[Dep. Biol., W. Va. Univ., Morgantown]

84-001203 Laevastu, T. QUANTITATIVE RELATIONS BETWEEN FISHING MORTALITY, SPAWNING STRESS MORTALITY AND BIOMASS GROWTH RATE (COMPUTED WITH NUMERICAL MODEL FISHMO). *NOAA Tech. Mem. NMFS F/NWC* 38. v + 22p. Jan. 1983. From Monthly Catalog of U.S. Government Publications, Jan. 1984, p. 59. SFA 29(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001204 Marshall, S. L.; G. T. Oliver; D. R. Bernard and S. A. McPherson. ACCURACY OF SCALE PATTERN ANALYSIS IN SEPARATING MAJOR STOCKS OF SOCKEYE SALMON (*ONCORHYNCHUS NERKA*) FROM SOUTHERN SOUTHEASTERN ALASKA AND NORTHERN BRITISH COLUMBIA. *Alaska Dep. Fish Game Inf. Leafl.* No. 230. iii + 28p. Jan. 1984. SFA 29(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Anchorage]

84-001205 Mathisen, O. A. and P. H. Poe. ESCAPEMENT LEVELS AND CARRYING CAPACITY IN SOME SOCKEYE SALMON PRODUCING SYSTEMS IN BRISTOL BAY, ALASKA. *Proc. Alaska Sci. Conf.* 33:171. 1982. Abstract only. SFA 29(2)
[Fish. Res. Inst., WH-10, Univ. Wash, Seattle 98195]

84-001206 Miranda, L. E. RELATION BETWEEN GROWTH, MORTALITY AND PROPORTIONAL STOCK DENSITY OF LARGEMOUTH BASS IN TEXAS RESERVOIRS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:29-38. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Ingram 78025]

84-001207 Penczak, T.; E. Suszycka and M. Molinski. PRODUCTION, CONSUMPTION AND ENERGY TRANSFORMATION BY FISH POPULATIONS IN A SMALL LOWLAND RIVER. *Ekol. Pol.* 30(1-2):111-137. 1982. In English with Polish summ. SFA 29(2)
[Inst. Environ. Biol., Univ. Lódz, Banacha 12/16, 90-237 Lódz, Poland] Eleven fish species were found at a sampling site in the upper course of a small lowland river in Poland. Their mean biomass was estimated as 37.41 kg.ha $^{-1}$ and total production as 35.31 kg.ha^{-1}.yr^{-1} (=796.85 MJ . ha^{-1} . yr^{-1}). Energy of the food consumed by these fish populations was 1725.63 MJ . ha^{-1} . yr^{-1}, which corresponds to 487.35 kg fresh weight of invertebrates (88%), 50.03 kg of plant material (9%) and 14.29 kg of fish (3%). The examined fish populations used 13.8 kg of invertebrates to produce 1 kg of fish tissue.

84-001208 Perry, W. G. OBSERVATIONS OF FINFISH STANDING CROP, SABINE NATIONAL WILDLIFE REFUGE. *Proc. La. Acad. Sci.* 46:17-28. 1983. SFA 29(2)
[La. Dep. Wildl. Fish., Grand Chenier 70643] Standing crop samples were collected at four stations on Sabine National Wildlife Refuge from 1979-1981. Annual estimates of finfish collected were extremely variable. The shallow Brown's Lake station estimates were 8.41-38.28 kg/ha, Back Ridge Canal, 22.44-110.66 kg/ha, Beach Canal, 3.92-411.00 kg/ha, and North Bayou, 5.16-16.69 kg/ha. The overall mean standing crop was 60.92 kg/ha. However, caution must be used in extrapolation of marsh standing crop values of fishes. Many areas are not necessarily optimum habitat and these samples were not intended to represent the entire refuge for the study period.

84-001209 Peterson, N. P. and C. J. Cederholm. A COMPARISON OF THE REMOVAL AND MARK-RECAPTURE METHODS OF POPULATION ESTIMATION FOR JUVENILE COHO SALMON IN A SMALL STREAM. *N. Am. J. Fish. Manage.* 4(1):99-102. 1984. SFA 29(2)
[Wash. Dep. Fish., Forks 98331]

84-001210 Shepherd, J. G. TWO MEASURES OF OVERALL FISHING MORTALITY. *J. Cons. Cons. Inst. Explor. Mer* 41(1):76-80. Oct. 1983. SFA 29(2)
[Fish. Lab., Lowestoft, Suffolk NR33 OHT, England] In age-structured models fishing mortality is usually described by the vector of F-at-age. There is a need for single number (scalar) measures of the overall fishing mortality, in order to (1) express the overall effect of exploitation suffered by the

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001210 CONTINUED population, and (2) for comparison and correlation with measures of fishing effort. These two purposes are incompatible, since the 'effect of exploitation' measure should change when the exploitation pattern is changed systematically (as for example by a mesh change), whereas the 'effort' measure should not. It is suggested that the ratio of catch (in number)-per-recruit to population (in number)-per-recruit is a suitable measure of the effect of exploitation, whilst average fishing mortality weighted by catch-at-age (on a per-recruit basis) is a suitable measure of F on the exploited phase, for correlation with effort. Since both measures are calculated on a cohort (per-recruit) basis, both are independent of fluctuations of year-class strength, which corrupt the usual average of F weighted by actual population number.

84-001211 Tonn, W. M. THE ORGANIZATION OF *UMBRA-PERCA* FISH ASSEMBLAGES IN NORTHERN WISCONSIN LAKES. *Ph.D. dissertation, Univ. Wis.* 200p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(9):2643. Mar. 1984. SFA 29(2)

The lakes of Wisconsin's Northern Highland come in a variety of morphometric and limnological conditions, making them ideal for comparative investigations as to how environmental factors influence the organization of their fish assemblages. I used multiple discriminant analysis to generate relationships among a set of five environmental variables and the fish assemblages types in 18 lakes. From these relationships, predictions of the assemblage type present in 11 additional Northern Highland lakes were made and tested with census data. *Umbra-Perca* fish assemblages, occurring in small, shallow bog lakes that have low oxygen levels in winter and low pH, contain, primarily or exclusively, central mudminnows, *Umbra limi*, and yellow perch, *Perca flavescens*. I compared the total biomass densities of fish in five *Umbra-Perca* assemblages, six times over three years, by mark-recapture and catch-per-effort methods to determine the presence, direction and intensity of interspecific interactions. Total assemblage density was independent of species richness (complete density compensation), but densities of mudminnow populations that co-occurred with perch averaged 10% of those in mudminnow-only lakes and didn't show the temporal fluctuations displayed by mudminnow-only and perch populations. Mudminnow populations co-occurring with perch, compared to mudminnow-only populations, showed a shift in their size structures from a predominance by small to a predominance by large individuals. Temporal patterns within lakes where perch populations declined, then recovered, from winterkill complemented the spatial, among-lake comparisons. Laboratory experiments in 2000 l aquaria confirmed hypotheses that suggested a predator-prey relationship, affected by the size structures of both perch and mudminnows, was primarily responsible for the spatial and temporal patterns observed in the lakes. Perch must reach a minimum size before they can significantly alter mudminnow populations through predation. Large mudminnows have attained a refuge from predation in size. An examination of the growth of young-of-the-year of both species under different density levels of conspecifics and heterospecifics suggested that growth is regulated more by interspecific competition for mudminnows, but intraspecific competition is more important for perch.

84-001212 Venkataraman, G.; M. Badrudeen and R. Thiagarajan. POPULATION DYNAMICS OF SILVERBELLY *LEIOGNATHUS JONESI* IN PALK BAY. *Indian J. Fish.* 28(1-2):65-86. 1981. SFA 29(2)

[Cent. Mar. Fish. Res. Inst., Mandapam Camp, India] Based on catch, effort and length-distribution data on *Leiognathus jonesi* collected at Mandapam over a period of six seasons, age and growth, selection factor, coefficient of total mortality (Z) and coefficient of natural mortality (M) were derived. For the estimated natural mortality rate (2.1) and for the mesh size (25mm codend) now in operation, the optimum effort has been found to be

POPULATION STUDIES, PRODUCTION, RECRUITMENT, ETC. (CONTINUED)

84-001212 CONTINUED 50,000 standard night effort, (=5,000 std. day effort), the yield per hundred recruits being 310 g. The isopleth diagram indicates that there was overfishing of silverbellies in 1973-74 and 1974-75 when the effort far exceeded the optimum level. The isopleth diagram also shows that the present mesh size yields the best catch and an increase in mesh size to 35 mm or decrease to 15 mm leads only to a decrease in yield. For a scientific management of the fishery, it is suggested that the effort be maintained at 50,000 night standard effort with the present mesh size at 25 mm so as to obtain sustained yield of this fish in the coming years.

84-001213 Vitali, R. and L. Braghieri. POPULATION DYNAMICS OF *BARBUS BARBUS PLEBEJUS* (VALENCIENNES) AND *LEUCISCUS CEPHALUS CABEDA* (RISSO) IN THE MIDDLE RIVER PO (ITALY). *Hydrobiologia* 109(2):105-124. 17 Feb. 1984. SFA 29(2)

[ENEL-DCO Lab. Cent., Via Nino Bixio, 39, 29100 Piacenza, Italy] Scales from 427 *Barbus barbus plebejus* and 406 *Leuciscus cephalus cabeda* from the middle River Po were examined. The last annulus was formed between April and May 1977, except the 0-1 age-group of *L. c. cabeda* which developed its first year-ring between March and April 1977. The survival (S) and annual mortality (A) rates were equivalent in both fish populations; the same was true of both sexes of *Leuciscus*, but S in *Barbus* males was lower than in females. The sex ratio showed a preponderance of females in both species. Growth rate from June to September 1976 was higher than in the rest of the year. Annual growth in *Barbus* females was higher than in males, whereas both sexes in *Leuciscus* showed equivalent growth rates; growth rate was higher in *Barbus* than in *Leuciscus*. The P/B ratio of both species was higher in the young age-groups.

84-001214 Wenner, C. A. SPECIES ASSOCIATIONS AND DAY-NIGHT VARIABILITY OF TRAWL-CAUGHT FISHES FROM THE INSHORE SPONGE-CORAL HABITAT, SOUTH ATLANTIC BIGHT. *NOAA Fish. Bull.* 81(3):537-552. July 1983. SFA 29(2)

[Mar. Resour. Res. Inst., S.C. Wildl. Mar. Resour. Dep., P.O. Box 12559, Charleston 29412]

84-001215 Yohannan, T. M. POPULATION DYNAMICS OF INDIAN MACKEREL BASED ON DATA FROM MANGALORE DURING 1967-1975. *Indian J. Fish.* 29(1-2):50-62. 1982. SFA 29(2)

[Res. Cent., Cent. Mar. Fish. Res. Inst., Calicut, India]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC.

84-001216 Badapanda, H. S.; P. K. Das and G. C. Patnaik. OBSERVATIONS ON THE FREQUENCY OF INTRASEASONAL MATURITY AND BUNDH BREEDING OF *LABEO ROHITA* (HAM) AND *CIRRHINUS MRIGALA* (HAM) AT SONEPUR, ORISSA. *Indian J. Fish.* 29(1-2):112-117. 1982. SFA 29(2)

[Fish. Dep., Orissa, India] During July, 1980, natural spawning of *Labeo rohita* (Ham) and *Cirrhinus mrigala* (Ham) have been observed *en masse* both in dry and wet bundhs for the first time in Orissa. The brood stock kept in distressed condition during summer months have spawned naturally in early part of monsoon. Feeding with groundnut oil-cake at 0.5% (before spawning) and at 1.0% (after spawning) of body weight of the fishes has helped in secondary intra-seasonal maturity after a period of 49 days. These gravid fish have been found to spawn naturally again in the wet bundh

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001216 CONTINUED after a gap of 64 days. Such observations have been recorded for the first time in India. Topography and soil texture of the bundhs and environmental physico-chemical factors at the time of spawning have been discussed.

84-001217 Beacham, T. D. VARIABILITY IN SIZE AND AGE AT SEXUAL MATURITY OF WITCH FLOUNDER, *GLYPTOCEPHALUS CYNOGLOSSUS*, IN THE CANADIAN MARITIMES REGION OF THE NORTHWEST ATLANTIC OCEAN. *Can. Field-Nat.* 97(4):409-422. Oct.-Dec. 1983. SFA 29(2)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] The variability in length and age at which 50% of individuals were mature was investigated for Witch Flounder (*Glyptocephalus cynoglossus*) in the Northwest Atlantic Ocean from 1959 to 1979. Median length and age at maturity generally declined through time, and males matured at smaller sizes and younger ages than did females. During 1975-1979, median length at maturity for males ranged from 29.2cm (NAFO Division 4W) to 33.0cm (Division 4T), while median age at maturity ranged from 5.1 yr (Division 4X) to 9.2 yr (Subdivision 4Vn). Median length (and age) at maturity for females ranged from 33.0 cm (8.8 yr) Subdivision 4Vn to 34.3cm (7.2 yr) in Division 4X. Witch flounder in warmer waters matured at younger ages than did those in colder waters. Biological and fishery mechanisms causing these changes are examined.

84-001218 Chatelain, R. and J. Chabot. UTILISATION D'ACCUMULATIONS DE COQUILLES D'UNIONIDAE COMME FRAYÈRES PAR LE TOULADI (*SALVELINUS NAMAYCUSH*). [UTILIZATION OF ACCUMULATIONS OF UNIONIDAE SHELLS FOR SPAWNING BY LAKE TROUT (*SALVELINUS NAMAYCUSH*).] *Nat. Can. (Que.)* 110(3):363-365. Dec. 1983. In French with English summ. SFA 29(2)

[Serv. Manage. Exploitation Faune, Minist. Loisir, Chasse Pêche, 13 rue Buteau, Hull, PQ J8Z 1V4, Canada] The authors report the use of large accumulations of Unionidae shells for spawning by lake trout (*Salvelinus namaycush*) in Petit lac des Cèdres in southwestern Québec. With the exception of a spawning site located in a portion of the des Cèdres stream bed, the searches did not reveal, in any of the cases, eggs deposited on rocky sites; only those sites where there were accumulations of Unionidae shells were utilized. On the two types of habitat managed for the spawning of lake trout, the first consisting of rubble, and the second, of Unionidae shells, only the latter was used by lake trout.

84-001219 Courtenay, S. C. and M. H. A. Keenleyside. NEST SITE SELECTION BY THE FOURSPINE STICKLEBACK, *APELTES QUADRACUS* (MITCHILL). *Can. J. Zool.* 61(7):1443-1447. July 1983. In English with French summ. SFA 29(2)

[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada]

84-001220 De, D. K. and P. M. Mitra. STUDIES ON THE FECUNDITY OF *SETIPINNA TATY* (VALENCIENNES) AND *TRICHIURUS PANTULUI* GUPTA OF THE HOOGHLY ESTUARINE SYSTEM. *Indian J. Fish.* 28(1-2):272-275. 1981. SFA 29(2)

[Cent. Inland Fish. Res. Inst., Barrackpore, West Bengal, India] Fecundity study on *Setipinna taty* (Valenciennes) and *Trichiurus pantului* Gupta of the Hoogly Estuarine System has shown that the weight is the best predictor variable for estimating fecundity of *S. taty*, whereas, for *T. pantului* total weight is the best. The estimating equations are worked out as $X_1 = 877.95+1.897X_2$ for *S. taty* and $X_1 = -1210.05+57.856X_4$ for *T. pantului*, where X_1 is fecundity in number, X_2 is the gonad weight in mg and X_4 is the total weight in mg.

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001221 Dempsey, C. H. and R. N. Bamber. SPAWNING OF HERRING (*CLUPEA HARENGUS* L.) IN THE BLACKWATER ESTUARY, SPRING 1979. *J. Cons. Cons. Inst. Explor. Mer* 41(1):85-92. Oct. 1983. SFA 29(2)

[Cent. Elec. Res. Lab., Mar. Biol. Unit, Cent. Elec. Gen. Bd., Fawley, Southampton SO4 1TW, U.K.] A survey of the Blackwater Estuary, Essex, was carried out in 1979 by grab and dredge sampling to define the spawning grounds of the herring, *Clupea harengus* L. Seabed temperatures were recorded in order to predict hatching times of any eggs found. Herring eggs from spawnings, a week apart, were found on the Eagle Bank, an area known as a spawning site, but nowhere else in the estuary. The Eagle Bank sediments consisted of coarse pebbles, shell breccia, and gravel in a muddy sand matrix. Spawning was in two distinct patches covering 9970 m^2 amd 4730 m^2, with egg densities of 170 300 and 456 100 eggs m^{-2} respectively. From fecundity data this would reflect a spawning population of 1.25 X 10^5 adult females. A further spawning was detected by a subsequent larval survey, which gave the total estimate of the spawning stock as 4.99 X 10^5 fish. This figure agrees closely with estimates of stock size from landing figures.

84-001222 Forbes, A. M. REVIEW OF SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*) SPAWNING REQUIREMENTS AND FIRST YEAR SURVIVAL IN LAKES. *Wis. Dep. Nat. Resour. Res. Rep.* 111. 12p. Sept. 1981. SFA 29(2)

[Bur. Res., Wis. Dep. Nat. Resour., Madison] A literature review was conducted to assess current knowledge of smallmouth bass spawning requirements and first year survival in lakes. The review is intended for use in considering research needs for management of smallmouth bass habitat in Wisconsin lakes. While there is considerable information on the requirements for nesting and spawning (including substrate, adjacent cover, water depth, protection from wind and wave action, temperature) and on causes of nest failure, there is relatively little information on nursery habitats. The management of smallmouth bass habitat to encourage natural reproduction by providing spawning substrate or objects for adjacent nest cover appears to be promising. However, the overriding factor affecting year class strength in Wisconsin lakes, which are toward the northern limit of smallmouth distribution, is the temperature regime in the first growing season. Care must be taken not to "improve" habitat when climatic factors rather than physical habitat are implicated as limiting. Where lack of adequate recruitment is a problem, a simple increase in nest number may not increase population size if we do not simultaneously consider habitat requirements for fry and fingerlings and other variables affecting year class strength. Research is needed to select and evaluate techniques and to develop management guidelines.

84-001223 Goff, G. P. BROOD CARE OF LONGNOSE GAR (*LEPISOSTEUS OSSEUS*) BY SMALLMOUTH BASS (*MICROPTERUS DOLOMIEUI*). *Copeia* 1984(1):149-152. 23 Feb. 1984. SFA 29(2)

[Dep. Zool., Univ. West. Ontario, London, ON N6A 5B7, Canada] Longnose gar eggs were discovered in 10 of 69 smallmouth bass nests. The male bass provided brood care for the eggs and larvae of both species. Nests with young of both species had higher success than nests with bass alone. The costs and benefits of this nesting relationship are discussed in relation to the high predation effort observed.

84-001224 Healey, M. C. and K. Dietz. VARIATION IN FECUNDITY OF LAKE WHITEFISH (*COREGONUS CLUPEAFORMIS*) FROM LESSER SLAVE AND UTIKUMA LAKES IN NORTHERN ALBERTA. *Copeia* 1984(1):238-242. 23 Feb. 1984. SFA 29(2)

[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001225 Keegan-Rogers, V. UNFAMILIAR-FEMALE MATING ADVANTAGE AMONG CLONES OF UNISEXUAL FISH (*POECILIOPSIS*: POECILIIDAE). *Copeia* 1984(1):169-174. 23 Feb. 1984. SFA 29(2)
[Biol. Sci. Group, Univ. Conn., Storrs 06268]

84-001226 Kirschbaum, F. REPRODUCTION OF WEAKLY ELECTRIC TELEOSTS: JUST ANOTHER EXAMPLE OF CONVERGENT DEVELOPMENT? *Environ. Biol. Fishes* 10(1-2):3-14. 15 Feb. 1984. SFA 29(2)
[Zool. Inst., Univ. Köln, I. Lehrstuhl, Weyertal 119, 5000 Köln 41, West Germany]

84-001227 Kitagawa, D. and S. Nagahora. ESTIMATION OF THE SPAWNING SEASON OF THE MORID FISH *PHYSICULUS MAXIMOWICZI* COLLECTED FROM THE COASTAL WATERS OF IWATE PREFECTURE, JAPAN. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1649-1654. Nov. 1983. SFA 29(2)
[Iwate Pref. Fish. Exp. Stn., Kamaishi 026, Japan]

84-001228 McAuliffe, J. R. and D. H. Bennett. OBSERVATIONS ON THE SPAWNING HABITS OF THE YELLOWFIN SHINER, *NOROPIS LUTIPINNIS*. *J. Elisha Mitchell Sci. Soc.* 97(3):200-203. 1981. SFA 29(2)
[Dep. Ecol. Evol. Biol., Univ. Ariz., Tucson 85721] In a small South Carolina stream, aggregations of the small shiner, *Notropis lutipinnis*, spawned on the surfaces of dome-shaped gravel and pebble nests. The nests were commonly over 50 cm in diameter and the sizes of pebbles comprising them were much too large for the shiners to have independently constructed the nests. Original nest construction can be attributed to the larger chub, *Nocomis leptocephalus*. *Nocomis* were commonly seen at the leading edges of the nests. All species of *Nocomis* construct the type of nests that was observed. Successful spawning by *Notropis lutipinnis* in streams with predominantly sandy substrates may be limited to gravel accumulations made by larger nest-builders such as *Nocomis leptocephalus*.

84-001229 Neilson, J. D. and C. E. Banford. CHINOOK SALMON (*ONCORHYCHUS TSHAWYTSCHA*) SPAWNER CHARACTERISTICS IN RELATION TO REDD PHYSICAL FEATURES. *Can. J. Zool.* 61(7):1524-1531. July 1983. In English with French summ. SFA 29(2)
[Can. Dep. Fish. Oceans, St. Andrews Biol. Stn., St. Andrews, NB E0G 2X0, Canada]

84-001230 Nicolette, J. P. A 3-YEAR-OLD PINK SLAMON IN AN ODD-YEAR-RUN IN LAKE SUPERIOR. *N. Am. J. Fish. Manage.* 4(1):130-132. 1984. SFA 29(2)
[Dep. Fish. Wildl., Univ. Minn., Saint Paul 55108]

84-001231 Nishiyama, T. A CONSIDERATION ON THE RELATION BETWEEN MATURITY CONDITION AND RETURN TIMING OF SOCKEYE SALMON IN BRISTOL BAY. *Proc. Alaska Sci. Conf.* 33:174. 1982. Abstract only. SFA 29(2)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701]

84-001232 Pariseau, R.; P. Dumont and J. G. Migneault. DéCOUVERTE DANS LE SUD-OUEST DU QUÉBEC, D'UNE POPULATION DE CISCO DE LAC, *CORREGONUS ARTEDII*, FRAYANT AU PRINTEMPS. [DISCOVERY, FROM THE

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001232 CONTINUED SOUTH-WEST QUEBEC, OF A POPULATION OF SPRING SPAWNING CISCO, *COREGONUS ARTEDII*.] *Can. J. Zool.* 61(10):2365-2368. Oct. 1983. In French with English summ. SFA 29(2)
[Serv. Aménage Exploitation Faune Québec, Minist. Loisir Chasse Pêche, 13, rue Buteau, Hull, PQ J8Z 1V4, Canada]

84-001233 Phillips, P. C. OBSERVATIONS ON ABUNDANCE AND SPAWNING SEASONS OF THREE FISH FAMILIES FROM AN EL SALVADOR COASTAL LAGOON. *Riv. Biol. Trop.* 31(1):29-36. June 1983. In English with Spanish summ. SFA 29(2)
[Esc. Cienc. Biol., Univ. Nac., Heredia, Costa Rica]

84-001234 Ross, J. L. and J. V. Merriner. REPRODUCTIVE BIOLOGY OF THE BLUELINE TILEFISH, *CAULOLATILUS MICROPS*, OFF NORTH CAROLINA AND SOUTH CAROLINA. *NOAA Fish. Bull.* 81(3):553-568. July 1983. SFA 29(2)
[N.C. Div. Mar. Resour., P.O. Box 967, Manteo 27954] Blueline tilefish, *Caulolatilus microps*, were obtained by hook and line fishing and port sampling operations off North Carolina and South Carolina from 1972-1977. *Caulolatilus microps* spawn off the Carolinas from April through October, with peak activity off North Carolina in May-June and September-October. Multiple spawnings by individual females were indicated by multimodel size distributions of ova; this is complemented by the continuous producion of spematozoa in testes, which is facilitated by dynamic spermatogenic tubules. Fecundity is best predicted by fish weight: in Fecundity = 0.016+1.832 in Weight. Fecundity estimates ranged from 0.2 million ova for a 412 mm TL(0.82kg) fish to 4.1 million ova for a 736 mm TL(4.85kg) fish. Females attained sexual maturity between 425 and 450 mm TL(age IV-V). Males showed pronounced testicular development after age V(500 mm TL). Females were more abundant from 300 to 500 mm TL; the sex ratio was 1:1 between 500 and 600 mm TL; males predominated in size classes greater than 600 mm TL. Protogynous sex reversal in three juvenile specimens (156-202 mm TL) was indicated by transitional gonads or testes with residual oocytes. Previtellogenic oocytes in 8 of 42 mature males (436-700 mm TL) further suggest protogyny, although no adult fish with transitional gonads were observed. Whether blueline tilefish are strictly juvenile or functional hermaphrodites has yet to be determined.

84-001235 Seshappa, G. OBSERVATIONS ON SEX PROPORTIONS AND MATURITY TRENDS IN *CYNOGLOSSUS BILINEATUS* (LACEPEDE) AND *C. MACROLEPIDOTUS* (BLEEKER) AT CALICUT DURING 1968-73. *Indian J. Fish.* 27(1-2):209-214. 1980. SFA 29(2)
[865, III Cross Rd., Srirampura, Bangalore 560021, India]

84-001236 Shamsul Hoda, S. M. MATURATION AND SPAWNING OF THE ANCHOVY *THRYSSA MYSTAX* IN THE NORTHERN ARABIAN SEA. *Indian J. Fish.* 29(1-2):213-222. 1982. SFA 29(2)
[Cent. Excellence Mar. Biol., Univ. Karachi, Karachi-32, Pakistan] Maturity studies carried out on *Thryssa mystax* (Bloch & Schneider), collected from commercial landings at Karachi Fish Harbour, from January to December, 1977, show that the female-male ratio is 1.26 : 1, and, as revealed by ova-diameter polygons, spawning occurs twice a year. There are two peak spawning seasons, in January-March and June-July, as borne out by the close approximation of GSI and relative condition coefficient. The minimum size at sexual maturity was about 140 mm TL for both sexes. The relations between total length of fish and length and breadth of gonads, and between fish

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001236 CONTINUED weight and gonad weight have been determined. The logarithmic relationships between fecundity and total length and body weight and ovary weight have also been established.

84-001237 Shaul, L. D.; P. L. Gray and J. F. Koerner. MIGRATORY PATTERNS AND TIMING OF STIKINE RIVER COHO SALMON (*ONCORHYNCHUS KISUTCH*) BASED ON CODED-WIRE TAGGING STUDIES, 1978-1982. *Alaska Dep. Fish Game Inf. Leafl.* No. 232. iv + 42p. Feb. 1984. SFA 29(2)
[Alaska Dep. Fish Game, Div. Commer. Fish., Juneau]

84-001238 Sly, P. G. THE SIGNIFICANCE OF SEASONAL CHANGES ON A MODERN COBBLE-GRAVEL BEACH USED BY SPAWNING LAKE TROUT, LAKE ONTARIO. *J. Great Lakes Res.* 10(1):78-84. 1984. SFA 29(2)
[N.Y. State Dep. Environ. Conserv., Cape Vincent 13618] In 1979, lake trout (*Salvelinus namaycush*) spawning was observed and confirmed by divers over a modern cobble-gravel beach in eastern Lake Ontario. Seasonal beach surveys determined that areas where egg deposition took place coincided closely with areas of course cobble-gravel where sediment accumulation rates were highest. Egg deposition occurred at depths below subsequent winter ice contact. The seasonal transport of cobble-gravel seems to have largely preceded the spawning episode but addition of some finer gravels, in the areas of egg depositon, did occur before freeze-over. There was no survival to hatch.

84-001239 Snelson, F. F., Jr. SEASONAL MATURATION AND GROWTH OF MALES IN A NATURAL POPULATION OF *POECILIA LATIPINNA*. *Copeia* 1984(1):252-255. 23 Feb. 1984. SFA 29(2)
[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816]

84-001240 Snelson, F. F., Jr. and J. D. Wetherington. SEX RATIO IN THE SAILFIN MOLLY, *POECILIA LATIPINNA*. *Evolution* 34(2):308-319. Mar. 1980. SFA 29(2)
[Dep. Biol. Sci., Univ. Cent. Fla., Orlando 32816]

84-001241 Warner, R. R. MATING BEHAVIOR AND HERMAPHRODITISM IN CORAL REEF FISHES. *Am. Sci.* 72(2):128-136. Mar.-Apr. 1984. SFA 29(2)
[Dep. Biol. Sci., Univ. Calif., Santa Barbara 93106]

84-001242 Witzel, L. D. and H. R. MacCrimmon. EMBRYO SURVIVAL AND ALEVIN EMERGENCE OF BROOK CHARR, *SALVELINUS FONTINALIS*, AND BROWN TROUT, *SALMO TRUTTA*, RELATIVE TO REDD GRAVEL COMPOSITION. *Can. J. Zool.* 61(8):1783-1792. Aug. 1983. In English with French summ. SFA 29(2)
[Ontario Minist. Nat. Resour., Port Dover, ON N0A 1N0, Canada] Effects of three homogeneous gravels (2.7, 6.2, and 9.2mm in diameter) and five heterogeneous gravel mixtures (with 0, 20, 40, 60, and 80% sand; geometric mean diameters = 14.2, 10.1, 7.2, 5.1, 3.7mm, respectively) on embryo survival and subsequent emergemce of brook charr (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*) were examined in the laboratory using vertical flow incubators. Differences in survival to emergence, temporal components of emergence, and developmental stage of emergents are significant ($P \leq 0.05$) among gravel types within and between species. Alevin survival, time interval to first and 50% emergence, and duration of emergence period vary directly with gravel size and inversely

SPAWNING HABITS AND MOVEMENTS, FECUNDITY, ETC. (CONTINUED)

84-001242 CONTINUED with sand concentration. Survivals of 0 to 20% occurred in unigranular gravels 6.2mm or finer and in multitexured gravels with 60% or more sand, and rates of 60 to 96% were found in 9.2-mm gravel and gravels with 20% or less sand. Emergent survival increased from 14 to 79% in gravels of 6.2 to 9.2mm, and from 2 to 96% in sand cncentrations between 60 and 20% because of reduced entrapment. Period of emergence was longest in 9.2-mm gravel (mean for charr, 381 day degrees; mean for trout, 423 day degrees). and in 0% sand-gravel mixture (mean for charr, 232 day degrees; mean for trout, 179 day degrees). Premature emergence of alevins over a shortened emergence period in finer gravels is identified as a stress response. Larger gravel and lower sand concentrations produced the largest and most advanced alevins at emergence. Ecological implications of the results are examined.

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC.

84-001243 Chen, L. F.; T. Nishiyama; R. R. French; R. G. Bakkala; S. Murai and G. B. Smith. THE EFFECTS OF THE WATER TEMPERATURE ON THE DISTRIBUTION PATTERNS AND GROWTH OF WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA* PALLAS, IN THE SOUTHEASTERN BERING SEA. *Proc. Alaska Sci. Conf.* 33:155. 1982. Abstract only. SFA 29(2)
[Inst. Mar. Sci., Univ. Alaska, Fairbanks 99701]

84-001244 Healey, M. C. COASTWIDE DISTRIBUTION AND OCEAN MIGRATION PATTERNS OF STREAM- AND OCEAN-TYPE CHINOOK SALMON, *ONCORHYNCHUS TSHAWYTSCHA*. *Can. Field-Nat.* 97(4):427-433. Oct.-Dec. 1983. SFA 29(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada] Chinook salmon, *Oncorhynchus tshawytscha*, which spend a year or more in fresh water before migrating to sea (stream-type) have been considered to be an environmentally produced variant of those migrating to sea in their first year of life (ocean-type). The available evidence, however, shows that these two life-history types differ in the coastal distribution of their spawning populations, in their ocean distribution as immatures, and in the seasonal timing of their spawning migrations. These differences in distribution and behaviour cannot be accounted for by the fresh-water environmental conditions that might influence fresh-water residence. Rather, it appears that stream- and ocean-type Chinook Salmon are distinct races.

84-001245 Inagake, D. and T. Hirano. VERTICAL DISTRIBUTION OF THE JAPANESE SARDINE IN RELATION TO TEMPERATURE AND THERMOCLINE AT THE PURSE SEINE FISHING GROUNDS EAST OF JAPAN. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1533-1539. Oct. 1983. SFA 29(2)
[Ocean Res. Inst., Univ. Tokyo, Minamidai, Nokano-ku, Tokyo 164, Japan]

84-001246 Ionue, M. [EXPLOITATION OF FISHING GROUNDS OF SOUTHWARD MIGRANTS OF FALL SKIPJACKS IN THE NORTHWESTERN PACIFIC OCEAN.] *J. Fac. Mar. Sci. Technol. Tokai Univ.* No. 17. p. 121-130. 1983. In Japanese with English summ. SFA 29(2)
[Fac. Mar. Sci. Technol., Tokai Univ., Shimizu, Japan 424]

84-001247 Isakson, J. S. and P. H. Poe. SOCKEYE SALMON SMOLT AND FRY OUTMIGRATIONS, NEWHALEN RIVER, ALAKSA, SPRING 1982. *Proc. Alaska Sci. Conf.* 33:163. 1982. Abstract only. SFA 29(2)
[Dames and Moore, 155 N.E. 100th Street, Suite 500, Seattle, WA 98125]

MOVEMENTS, SEASONAL AND DEPTH DISTRIBUTION, ETC. (CONTINUED)

84-001248 Jonasson, B. UPSTREAM MOVEMENT AND DISTRIBUTION OF PRIVATE HATCHERY PRODUCED COHO SALMON SMOLTS INTO YAQUINA RIVER TRIBUTARIES. *Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep.* No. 83-13. i + 10p. June 1983. SFA 29(2)
[Oreg. Dep. Fish Wildl., Res. Dev. Sect., Corvallis]

84-001249 Montgomery, W. L.; S. D. McCormick; R. J. Naiman; F. G. Whoriskey, Jr. and G. A. Black. SPRING MIGRATORY SYNCHRONY OF SALMONID, CATOSTOMID, AND CYPRINID FISHES IN RIVIÈRE À LA TRUITE, QUÉBEC. *Can. J. Zool.* 61(11):2495-2502. Nov. 1983. In English with French summ. SFA 29(2)
[Dep. Biol. Sci., North. Ariz. Univ., Flagstaff 86011]

84-001250 Munekiyo, M. and A. Kuwahara. [SOME ASPECTS OF SPAWNING SCHOOLS OF RIBBON FISH *TRICHURUS LEPTURUS* DERIVED FROM CATCH RECORDS OF EXPERIMENTAL LONGLINE FISHING.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1515-1521. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

84-001251 Power, J. H. and J. D. McCleave. SIMULATION OF THE NORTH ATLANTIC OCEAN DRIFT OF *ANGUILLA* LEPTOCEPHALI. *NOAA Fish. Bull.* 81(3):483-500. July 1983. SFA 29(2)
[NMFS, P.O. Box 271, La Jolla, CA 92038]

84-001252 Reynolds, L. F. MIGRATION PATTERNS OF FIVE FISH SPECIES IN THE MURRAY-DARLING RIVER SYSTEM. *Aust. J. Mar. Freshwater Res.* 34(6):857-871. 1983. SFA 29(2)
[Div. State Fish., Dep. Agric., P.O. Box K220, Haymarket, N.S.W. 2000, Australia]

84-001253 Suresh, K. and M. P. M. Reddy. VARIATIONS IN OCEANOGRAPHIC FACTORS AND THEIR POSSIBLE RELATION TO FLUCTUATIONS IN OIL SARDINE AND MACKEREL CATCHES OFF MANGALORE COAST. *Indian J. Fish.* 27(1-2):2-9. 1980. SFA 29(2)
[Coll. Fish., Univ. Agric. Sci., Mangalore, India]

FOODS/FEEDING

84-001254 Appa Rao, T. FOOD AND FEEDING HABITS OF *PENNAHIA MACROPHTHALMUS* BLEEKER AT VISAKHAPATNAM. *Indian J. Fish.* 27(1-2):61-65. 1980. SFA 29(2)
The food and feeding habits of *Pennahia macrophthalmus* Bleeker, a sciaenid occurring in the trawl catches at Visakhapatnam, was studied during the period March 1968-December 1973. *P. macrophthalmus* is a macrophagous carnivore feeding on teleosts and prawns. Among the teleosts, *Bregmaceros macclellandi* and *Anchoviella* sp. are predominant. Prawns namely *Penaeus* sp., *Metapenaeus* sp., *Acetes* sp. are found to be major components among the crustaceans. Study of food in relation to different size groups showed *P. macrophthalmus* became more icthyophagous with age. Low feeding between February-April, moderate feeding between May-July and high feeding during the rest of the months seemed to prevail.

FOODS/FEEDING (CONTINUED)

84-001255 Balasundar Reddy, P. FOOD AND FEEDING HABITS OF *CHANNA PUNCTATA* (BLOCH) FROM GUNTUR. *Indian J. Fish.* 27(1-2):123-129. 1980. SFA 29(2)
[Dep. Zool., Andhra Loyola Coll., Vijayawada, India] *Channa punctata* is piscivorous. Thirteen species of fish are identified in the gut contents. The other major food items include fish larvae, insects and crustaceans. Molluscan shells and tadpoles are rare. Index of preponderance reveals the greater importance of the fish in the diet. Intensive feeding is during June-July and November-December.

84-001256 Baltz, D. M. and P. B. Moyle. SEGREGATION BY SPECIES AND SIZE CLASSES OF RAINBOW TROUT, *SALMO GAIRDNERI*, AND SACRAMENTO SUCKER, *CATOSTOMUS OCCIDENTALIS*, IN THREE CALIFORNIA STREAMS. *Environ. Biol. Fishes* 10(1-2):101-110. 15 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Biol., Univ. Calif., Davis 95616] The hypothesis that Sacramento suckers, *Catostomus occidentalis*, compete with rainbow trout, *Salmo gairdneri*, for space in streams was examined by measuring microhabitat utilization of both species in three California streams. Two streams were similar in most respects except one contained only trout and one contained trout and a large population of suckers. The third stream, formed by the union of the first two, contained trout and a small population of suckers. The species overlapped in five of the six microhabitat variables measured: maximum depth, mean water column vleocity, focal point velocity, surface water velocity, and substrate type. However, the species had strong vertical segregation; there was little overlap between species in focal point depth. Mean focal point velocities were also significantly different. Suckers roamed over and generally remained in contact with the bottom while trout held position in the water column. Microhabitat utilization by trout in the stream without suckers was similar to in the stream with a higher sucker density. Differences in microhabitat utlization by trout between the third and the other two was attributed to the larger size of the third stream. Both sucker and trout showed a similar within-species segregation of size classes--fish under 50 mm in length sought shallow water. Size-specific trends indicated ontogenic shifts in resource utilization which reduced overlap within species. These results suggest that competition for space between trout and suckers was not a major factor regulating microhabitat utilization of trout, although the possibility that larger suckers may displace small trout needs further study.

84-001257 Bennett, B.; C. L. Griffiths and M. Penrith. THE DIETS OF LITTORAL FISH FROM THE CAPE PENINSULA. *S. Afr. J. Zool.* 18(4):343-352. Nov. 1983. In English with Afrikaans summ. SFA 29(2)
[Zool. Dep., Univ. Cape Town, Rondebosch, 7700, South Africa]

84-001258 Bickerstaff, W. B.; C. D. Ziebell and W. J. Matter. VULNERABILITY OF REDBELLY TILAPIA FRY TO BLUEGILL PREDATION WITH CHANGES IN COVER AVAILABILITY. *N. Am. J. Fish. Manage.* 4(1):120-125. 1984. SFA 29(2)
[Oreg. Dep. Fish. Wildl., 2635 Hwy 101 North, Florence 97439]

84-001259 Buxton, C. D. and H. M. Kok. NOTES ON THE DIET OF *RHABDOSARGUS HOLUBI* (STEINDACHNER) AND *RHABDOSARGUS GLOBICEPS* (CUVIER) IN THE MARINE ENVIRONMENT. *S. Afr. J. Zool.* 18(4):406-408. Nov. 1983. In English with Afrikaans summ. SFA 29(2)
[Port Elizabeth Mus., P.O. Box 13147, Humewood, 6013 South Africa]

FOODS/FEEDING (CONTINUED)

84-001260 Campana, S. E. FEEDING PERIODICITY AND THE PRODUCTION OF DAILY GROWTH INCREMENTS IN OTOLITHS OF STEELHEAD TROUT (*SALMO GAIRDNERI*) AND STARRY FLOUNDER (*PLATICHTHYS STELLATUS*). *Can. J. Zool.* 61(7):1591-1597. July 1983. In English with French summ. SFA 29(2)
[Mar. Fish. Div., Bedford Inst. Oceanogr., P.O. Box 1006, Dartmouth, NS B2Y 4A2, Canada]

84-001261 Clausen, D. M. FOOD OF WALLEYE POLLOCK, *THERAGRA CHALCOGRAMMA*, IN AN EMBAYMENT OF SOUTHEASTERN ALASKA. *NOAA Fish. Bull.* 81(3):637-642. July 1983. SFA 29(2)
[NMFS, Auke Bay Lab., P.O. Box 155, Auke Bay, AK 99821]

84-001262 Coull, B. C. and J. B. J. Wells. REFUGES FROM FISH PREDATION: EXPERIMENTS WITH PHYTAL MEIOFAUNA FROM THE NEW ZEALAND ROCKY INTERTIDAL. *Ecology* 64(4):1599-1609. Dec. 1983. SFA 29(2)
[Belle W. Baruch Inst. Mar. Biol., Univ. S. C., Columbia 29208] Phytal meiofauna are numerically important members of rocky intertidal communities and known to be prey items for various small fishes. In a series of experiments we demonstrated that substrate complexity is an important factor in reducing predation. The alga *Corallina officinalis*, the most complex structure used, was the only refuge from blenny (*Helcogramma medium*) predation for total meiofauna, and the dominant taxon, copepods. This refuge effect was evident whether the prey fauna were originally from *Corallina* or from another alga. One harpacticoid copepod species (*Amphiascus lobatus*) was selectively preyed upon, with females preferentially taken over males. Our results and those from the literature suggest that fish predation on benthic invertebrates may not be linearly related to decreasing substrate complexity. Rather there appears to be a complexity threshold below which removal rate is not significantly affected by structure and above which removal rate is significantly reduced.

84-001263 Crowder, L. B. OPTIMAL FORAGING AND FEEDING MODE SHIFTS IN FISHES. *Bull. Ecol. Soc. Am.* 64(2):91. June 1983. Abstract only. SFA 29(2)
[N.C. State Univ., Raleigh] I examined the hypothesis that feeding mode shifts (e.g. from particulate feeding to filtering) are predictable based on the costs and benefits of foraging in various modes. Quantitative data on prey capture rates for particulate and filter feeding as a funcation of fish size, prey size and density were available for 3 clupeid fishes (northern anchovy, Pacific mackerel and alewife). Using regressions for anchovy particulate feeding on large prey and filtering small prey at various densities, I solved for an isopleth of equal return (mg/min) for the two feeding modes. In separate experiments, large and small prey were presented together to anchovies and feeding behaviors observed. Along the isopleth where cost/benefit ratios were quivalent for the two feeding modes, about 50% of the anchovies were observed filtering. Mode shifts in mackerel and alewife are less well documented, but also correlate well with expectations from optimal foraging.

84-001264 Cyrus, D. P. DIET OF *GERRES* FRY IN THE KOSI SYSTEM. *S. Afr. J. Zool.* 18(4):403-406. Nov. 1983. In English with Afrikaans summ. SFA 29(2)
[Dep. Zool., Univ. Natal, Pietermaritzburg, 3200 South Africa]

84-001265 Daborn, G. R. and R. S. Gregory. OCCURRENCE, DISTRIBUTION, AND FEEDING HABITS OF JUVENILE LUMPFISH, *CYCLOPTERUS LUMPUS* L. IN THE BAY OF FUNDY. *Can. J. Zool.* 61(4):797-801. Apr. 1983. In English with French

FOODS/FEEDING (CONTINUED)

84-001265 CONTINUED summ. SFA 29(2)
[Dep. Biol., Acadia Univ., Wolfville, NS B0P 1X0, Canada] Juvenile lumpfish (<55 mm length) occur in near-surface waters of the Bay of Fundy from July to September. Samples collected simultaneously with neuston and subsurface nets indicated that the juveniles occur primarily in the top few centimetres of the water column. Seasonal changes in distribution may be related to wind drift of surface waters and the residual circulation of the inner Bay. The length-weight relationship ($W=8.7L^{3.36} \times 10^{-6}$) indicates allometric growth up to 50 mm, at which time lumpfish probably leave surface waters and adopt a pelagic or benthic existence. Juvenille lumpfish feed on a wide range of near-surface plankton, shifting with growth from harpacticoid copepods (particularly *Harpacticus chelifer*) to the amphipods *Calliopius laeviusculus* and *Parathemisto gaudichaudi*.

84-001266 Deegan, L. A. and B. A. Thompson. DYNAMICS OF LIPID STORAGE AND FEEDING MODES OF JUVENILE GULF MENHADEN. *Bull. Ecol. Soc. Am.* 64(2):187. June 1983. Abstract only. SFA 29(2)
[La. State Univ., Baton Rouge] Lipid storage, growth, and feeding characteristics of juvenile gulf menhaden (*Brevoortia patronus*) were studied at 6 stations in a Louisiana estuary. Larvae (0.06 g 22 mm SL) enter the estuary in Dec.-Feb. and move to shallow brackish marsh areas. At this time they change from being selective zooplankton pickers to omnivorous nonselective filter feeders. During transformation they change body form and increase in weight (0.3 g) but not length (25 mm SL), and detritus becomes an important food source. Preliminary experiments suggest mehanden have the required enzymes for detritus digestion. Disproportionate allocation of energy to lipid storage begins shortly after transformation (≈ 2% body weight). In late summer juveniles (8 g, 69 mm SL) move to open areas of the estuary and allocate increasingly large amounts of energy to lipid storage (≈ 5% body weight). Lipid storage was maximal in the fall (≈ 10% body weight) just before migration to the gulf.

84-001267 Dombeck, M.; J. Hammill and W. Bullen. FISHERIES MANAGEMENT AND FISH DEPENDENT BIRDS. *Fisheries (Bull. Am. Fish. Soc.)* 9(2):2-4. Mar.-Apr. 1984. SFA 29(2)
Management of aquatic ecosystems can affect sensitive piscivores such as bald eagles, ospreys, and loons. Fisheries biologists must be aware of the needs of these species and should prepare mutiple-use management plans jointly with wildlife biologists where these avian species occur. The needs of these birds should be included in fisheries management objectives, and human disturbances should be minimized. Proper fish population manipulation and habitat management can enhance the feeding opportunities of these and other fish-dpendent birds.

84-001268 Drenner, R. CONSIDERATIONS OF PLANKTIVOROUS FEEDING BY EXOTIC FISHES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:14. 1983. Title only. SFA 29(2)
[Biol. Dep., Tex. Christian Univ., Fort Worth, TX 76129]

84-001269 Durbin, E. G.; A. G. Durbin; R. W. Langton and R. E. Bowman. STOMACH CONTENTS OF SILVER HAKE, *MERLUCCIUS BILINEARIS*, AND ATLANTIC COD, *GADUS MORHUA*, AND ESTIMATION OF THEIR DAILY RATIONS. *NOAA Fish.*

FOODS/FEEDING (CONTINUED)

84-001269 CONTINUED *Bull.* 81(3):437-454. July 1983. SFA 29(2)
[Grad. Sch. Oceanogr., Univ. R.I., Kingston 02881] The model of Elliott and Persson was used to estimate the daily ration of silver hake, *Merluccius bilinearis*, and Atlantic cod, *Gadus morhua*, collected in the western North Atlantic between Cape Hatteras and Nova Scotia during the years 1973-76. The model required field measurements of the weight of food in the stomachs during consecutive 3-h periods over 24 h, and laboratory estimates of the exponential gastric evacuation rate. The silver hake and Atlantic cod were each grouped into two size classes for analysis (≤20 cm and >20 cm, and ≤30 cm and >30 cm, respectively). Upper and lower daily ration estimates were 3.2 and 2.9% body weight (BW) per day for hake ≤20cm, 2.2 and 0.8% BW per day for hake >20 cm, and 1.5 and 0.9% BW per day for cod>30 cm. There were insufficient small cod to estimate daily ration. These ration estimates are intermediate between two previous estimates for silver hake and Atlantic cod on Georges Bank obtained by different methods.

84-001270 Geistdoerfer, P. L'ALIMENTATION DU MERLAN BLEU *MICROMESISTIUS POUTASSOU* (RISSO, 1826) (TÉLÉOSTÉENS, GADIDAE) DANS LE NORD-EST DE L'OCÉAN ATLANTIQUE. [THE FOOD HABITS OF BLUE WHITING *MICROMESISTIUS POUTASSOU* (RISSO, 1826) (TELOSTEI, GADIDAE) FROM THE NORTHEAST ATLANTIC OCEAN.] *J. Cons. Cons. Inst. Explor. Mer* 41(1):67-75. Oct. 1983. In French with English summ. SFA 29(2)
[Lab. Ichthyol. Gen. Appl., Mus. Natl. Hist. Nat., 43 rue Cuvier, 75231 Paris Cedex 05, France] The food habits of blue whiting, *Micromesistius poutassou*, were studied during various seasons in the northeast Atlantic. The 1238 blue whiting examined (16 827 preys) came from 28 trawl catches made by RV "Thalassa" of the Institute scientifique et techniques des Pêches maritimes, in division Va (northeast Iceland and Rosengarten) and subdivision Dbl (Faroe Plateau) in July 1978, in divisions VIIh (Ouessant) and VIIg (Smalls) in May 1979, and divisions IVa (N North Sea) and VIa (NW coast of Scotland and N Ireland) in February, March, and May 1980. Blue whiting feed on pelagic, planktonic, and nectonic groups, especially euphausiids (80.1% of the prey), including *Meganyctiphanes norvegica* and *Thysanoessa inermis*, calanid copepods (11.2% of prey), hyperid amphipods (4.5% of the prey), fish larvae and fishes (3.5% of the prey) including *Sprattus sprattus*, *Maurolicus muelleri*, and *Gadiculus argenteus thori*. A relationship was found between the feeding of blue whiting and its migration. In winter feeding activity decreases; many stomachs are empty when the blue whiting is on its spawning areas on the continental slope to the west of Ireland and the British Isles. In summer blue whiting feeds intensively on its feeding areas in the Norwegian Sea; few stomachs are empty.

84-001271 Gorelova, T. A. A QUANTITATIVE ASSESSMENT OF CONSUMPTION OF ZOOPLANKTON BY EPIPELAGIC LANTERNFISHES (FAMILY MYCTOPHIDAE) IN THE EQUATORIAL PACIFIC OCEAN. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):106-113. 1983. SFA 29(2)
[IOAN, Moscow, USSR]

84-001272 Gregory, R. S.; G. S. Brown and G. R. Daborn. FOOD HABITS OF YOUNG ANADROMOUS ALEWIVES, *ALOSA PSEUDOHARENGUS*, IN LAKE AINSLIE, NOVA SCOTIA. *Can. Field-Nat.* 97(4):423-426. Oct.-Dec. 1983. SFA 29(2)
[Dep. Biol., Acadia Univ., Wolfville, NS B0P 1X0, Canada] Gut contents of 60 larval and 170 juvenile *Alosa pseudoharengus*, in Lake Ainslie, Nova Scotia, collected in 1979, were examined concurrently with zooplankton

FOODS/FEEDING (CONTINUED)

84-001272 CONTINUED samples. Until August, the larvae fed primarily on the dominant zooplankters *Bosmina* spp., *Daphnia retrocurva* and *Diaptomus minutus*. In August, however, the young Alewives switched to feeding on adult Diptera and Ephemeroptera when zooplankton abundance was low. A substantial drop in average gut biomass was noted at this time. The contribution of these two orders of insects to the dry weight biomass of the gut was as high as 82.6% on 23 August.

84-001273 Gross, H. P. and J. M. Anderson. GEOGRAPHIC VARIATION IN THE GILLRAKERS AND DIET OF EUROPEAN THREESPINE STICKLEBACKS, *GASTEROSTEUS ACULEATUS*. *Copeia* 1984(1):87-97. 23 Feb. 1984. SFA 29(2)

[Representative, Bank of Nova Scotia, Wisma Metropolitan, 4th Floor, Jl. Jenderal Sudirman, Jakarta, Indonesia] Variation in the gillrakers and diet of threespine sticklebacks (*Gasterosteus aculeatus*) was evident throughout their European distribution. The gillrakers of completely-plated sticklebacks were more numerous, longer, and more closely spaced than those of low-plated sticklebacks. Among populations of either form, sticklebacks from lentic (marine, lake and pond) habitats had more gillrakers than did those from lotic (river and stream) habitats. Genetic control of gillraker number was demonstrated for one lake-dwelling and one stream-dwelling population. Lake-dwelling sticklebacks were found to consume more zooplankton than did stream-dwelling individuals although benthic invertebrates were important prey in both habitats. Variation in gillrakers could be attributed only in part to selection pressures arising from the greater abundance of zooplankton prey in lake than stream habitats. Evidence of stabilizing selection led us to conclude that conflicting selection pressures determined the habitat-characteristic patterns of geographic variation.

84-001274 Harada, K. and A. Ohwada. STATISTICAL APPROACH TO FINDING PROBABLE FEEDING ATTRACTANTS FOR JUVENILE YELLOWTAIL. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1541-1546. Oct. 1983. SFA 29(2)

[Lab. Biochem., Dep. Food Sci. Technol., Shimonoseki Univ. Fish., Shimonoseki 759-65, Japan]

84-001275 Johnson, D. M.; R. E. Bohanan; C. N. Watson and T. H. Martin. EXPLOITATION COMPETITION BETWEEN SMALL SUNFISH AND DRAGONFLY LARVAE. *Bull. Ecol. Soc. Am.* 64(2):90. June 1983. Abstract only. SFA 29(2)

[East Tenn. State Univ., Johnson City] Small sunfish (*Lepomis*) and dragonfly larvae (*Tetragoneuria* and *Celithemis*) exploit similar prey populations (benthic cladocerans, ostracods, oligochaetes, and midges) in allochthonous detritus habitats of Bays Mountain Lake. An in situ enclosure experiment, designed to detect both intra- and inter-taxon competition, was conducted during September 1982 using natural substrates and benthos. Fish and dragonfly numbers and size-distributions introduced into these enclosures approximated natural densities (F, D, & FD) or twice natural densities (FF & DD). Comparison on initial and final fish and dragonfly numbers and biomasses suggests that fish reduced dragonfly growth (but not survival) and that dragonflies had little affect on fish. It may be necessary to incorporate natural densities of small sunfish into future experiments designed to determine the importance of competition within this dragonfly assemblage.

FOODS/FEEDING (CONTINUED)

84-001276 Katunzi, E. F. B. SEASONAL VARIATION IN THE FOOD OF A MOLLUSCIVOROUS CICHLID *HAPLOCHROMIS SAUVAGEI* PFEFFER 1896. *Neth. J. Zool.* 33(3):337-341. Dec. 1983. SFA 29(2)
[Mwanza Fish. Res. Cent., P.O. Box 475, Mwanza, Tanzania]

84-001277 Kuwahara, A. and S. Suzuki. [DISTRIBUTION AND FEEDING HABITS OF A SOLE *HETEROMYCTERIS JAPONICUS* LARVAE.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1499-1506. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Kyoto Inst. Oceanic Fish Sci., Miyazu, Kyoto 626, Japan]

84-001278 Kuwahara, A. and S. Suzuki. [RELATIONSHIPS BETWEEN FEEDING HABITS OF FISH LARVAE AND THEIR FOOD ORGANISMS IN THE WESTERN WAKASA BAY.] *Bull. Jpn. Soc. Sci. Fish.* 49(1):1507-1513. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Kyoto Inst. Oceanic Fish. Sci., Miyazu, Kyoto 626, Japan]

84-001279 Lasiak, T. A. ASPECTS OF THE BIOLOGY OF THREE BENTHIC-FEEDING TELEOSTS FROM KING'S BEACH, ALGOA BAY. *S. Afr. J. Zool.* 19(1):51-56. Jan. 1984. In English with Afrikaans summ. SFA 29(2)
[Dep. Zool., Univ. Transkei, P. B. X5092, Umtata, Republic of Transkei]

84-001280 Livingston, P. A. FOOD HABITS OF PACIFIC WHITING *MERLUCCIUS PRODUCTUS*, OFF THE WEST COAST OF NORTH AMERICA, 1967 AND 1980. *NOAA Fish. Bull.* 81(3):629-636. July 1983. SFA 29(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-001281 Markham, D. F. OBSERVATIONS ON THE POPULATION ABUNDANCE AND FOOD COMPOSITION OF YOUNG FLATFISH AT SHERKIN ISLAND. *J. Sherkin Island* 1(2):93-99. 1981. SFA 29(2)
[Sherkin Island Mar. Stn., Cty. Cork, Ireland] Young plaice and flounder tend to accumulate at Rugher Strand in Kinish Harbour, where they selectively feed on a preferred diet of *Corophium*. This amphipod had re-established itself in the harbour, following a disappearance caused by the effects of a red tide. The population abundance of the plaice appeared to have been less than the numbers which had been reported for previous years. Mysidaceans, amphipods and copepods were the principal food organisms of young turbot, brill, plaice and flounder, which were captured in the shallow surf zone at Tranaplousa.

84-001282 Marrin, D. L.; D. C. Erman and B. Vondracek. FOOD AVAILABILITY, FOOD HABITS, AND GROWTH OF TAHOE SUCKER, *CATOSTOMUS TAHOENSIS*, FROM A RESERVOIR AND A NATURAL LAKE. *Calif. Fish Game* 70(1):4-10. Jan. 1984. SFA 29(2)
[Dep. Hydrol. Water Resour., Univ. Ariz., Tucson 85721] The diet of the Tahoe sucker, *Catostomus tahoensis*, inhabiting Webber Lake, a natural lake, is compared to the diets of Tahoe sucker in Stampede Reservoir, an artificial lake. Populations of benthic invertebrates and macrophytes differed in abundance between lake and reservoir. These differences had a substantial effect on the food habits of Tahoe sucker. The most important food items for lake suckers, mollusks and amphipods, were rarely found in the reservoir, and represented less than 1% of the total diet of reservoir suckers. Reservoir fish fed predominantly on macroalgae (43% by volume) and chironomid larvae (36%) and exhibited a less diverse diet than lake fish. Suckers beyond age I grew faster in Stampede Reservoir than in Webber lake.

FOODS/FEEDING (CONTINUED)

84-001283 Martin, T. J. and S. J. M. Blaber. THE FEEDING ECOLOGY OF AMBASSIDAE (OSTEICHTHYES: PERCIFORMES) IN NATAL ESTUARIES. *S. Afr. J. Zool.* 18(4):353-362. Nov. 1983. In English with Afrikaans summ. SFA 29(2)
[Dep. Zool., Univ. Natal, P.O. Box 375, Pietermaritzburg, 3200 South Africa]

84-001284 Miller, G. L. TROPHIC ECOLOGY OF THE FRECKLEBELLY MADTOM *NOTURUS MUNITUS* IN THE TOMBIGBEE RIVER, MISSISSIPPI. *Am. Midl. Nat.* 111(1):8-15. Jan. 1984. SFA 29(2)
[Dep. Entomol., Miss. Entomol. Mus., Miss. State Univ., Mississippi State 39762] Aspects of the trophic ecology of the frecklebelly madtom *Noturus munitus*, from a site on the Tombigbee River, Mississippi, are described. Aquatic insect larvae comprised the bulk of the diet. *Noturus munitus* differed little in gut content from a group of associated syntopic species. Males and females differed in mean prey length in autumn. Individual trophic diversity increased significantly in the autumn for both sexes and with standard length. Mean prey length and total prey volume did not increase with fish size.

84-001285 Milstead, W. B. FISH PREDATION EFFECTS ON SPRING AMPHIPODS. *Bull. Ecol. Soc. Am.* 64(2):91. June 1983. Abstract only. SFA 29(2)
[Univ. Okla., Norman] The effects of fish predation on populations of *Hyalella azteca* in a spring pool were investigated with enclosure experiments for a six month period. Darters (*Etheostoma spectabile*) were introduced into four of six enclosures in a spring pool known to be fishless for at least 40 years. Density, size structure, sex ratio and fecundity of the amphipod populations were measured every ten days from June through August, 1982, and monthly thereafter. Size structure and sex ratio appear to be altered by size selective fish predation. Preferential loss of juveniles in fish enclosures resulted from growth of older juveniles and reduced recruitment associated with adult mortality.

84-001286 Morgan, W. L. and D. A. Ritz. EFFECT OF PREY DENSITY AND HUNGER STATE ON CAPTURE OF KRILL, *NYCTIPHANES AUSTRALIS* SARS, BY AUSTRALIAN SALMON, *ARRIPIS TRUTTA* (BLOCH & SCHNEIDER). *J. Fish Biol.* 24(1):51-58. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Tasmania, Box 252C, G.P.O., Hobart, Tasmania, Australia 7001] When hungry salmon were offered a simulated (unattainable) swarm of krill with high central density, the density of the region first attacked increased with increasing attack readiness (measured as snout contacts). When allowed to capture krill in a range of prey densities, hungry salmon captured krill most successfully (in terms of capture/contacts) in the lowest density and less efficiently with increasing densities. However, salmon still captured a greater number of krill in a given time in high compared to low densities. When salmon in three different hunger states were exposed to a simulated swarm of krill, those with the lowest hunger level most often attacked the lowest prey density first. Salmon with a high humger level most often attacked the highest prey density first. Those fish with a moderate hunger level chose an intermediate prey density. This behaviour can be interpreted as a hunger-dependent feeding strategy. The ways in which swarming of the prey might influence capture by the predator are considered.

84-001287 Morin, P. J. ODONATE GUILD COMPOSITION: THE IMPORTANCE OF INTERACTIONS BETWEEN FISH PREDATION AND HISTORICAL EFFECTS. *Bull. Ecol. Soc. Am.* 64(2):90. June 1983. Abstract only. SFA 29(2)
[Coll. Holy Cross, Worcester, MA] I examined interactions between the effects of fish and spring-breeding odonates on larval recruitment of summer-breeding odonates in a North Carolina farm pond. In the absence of

FOODS/FEEDING (CONTINUED)

84-001287 CONTINUED fish, two summer-breeders (*Perithemis tenera* and *Pachydiplax longipennis*) were significantly more abundant when later pen placement reduced the abundances of *Epitheca cynosura* and *Plathemis lydia*. In contrast, fish increased the abundance of larval *Perithemis*, regardless of the timing of pen placement. Fish significantly reduced the abundances of other spring- or summer-breeding odonates. This reduction in the abundance of spring-breeders moderated their negative impact on summer-breeders. Significant negative correlations between the abundances of spring- and summer-breeders in fish exclosures were not observed in pens where fish foraged. Although colonization history influenced interactions among odonates in predator exclosures, these historical effects did not generalize to similar communities subject to fish predation.

84-001288 Moring, J. R. FEEDING OF UNDERYEARLING WALLEYE SURFPERCH, *HYPERPROSOPON ARGENTEUM*, IN A NORTHERN CALIFORNIA BAY. *Estuaries* 7(1):102-104. Mar. 1984. SFA 29(2)

[Me. Coop. Fish. Res. Unit, Dep. Zool., Univ. Me., Orono 04469] A study of the feeding of underyearling walleye surfperch (*Hyperprosopon argenteum*) was based on fish collected in seven areas of Humboldt Bay, California, during September and October 1969. Crustaceans were found in all stomachs containing food, but the type of major food consumed varied with distance from the entrance channel. Amphipods were universally consumed, with cypris stages more important in areas with high tidal exchange, and terrestrial moth flies (*Psychoda* spp.) and harpacticoid copepods more important in backwater areas. Collections indicate daylight feeding and probably limited diurnal movements of underyearling walleye surfperch, a different pattern of feeding behavior than walleye surfperch of inshore waters of southern California.

84-001289 Moyle, P. B. and F. R. Senanayake. RESOURCE PARTITIONING AMONG THE FISHES OF RAINFOREST STREAMS IN SRI LANKA. *J. Zool. (Lond.)* 202(2):195-223. Feb. 1984. SFA 29(2)

[Wildl. Fish. Biol., Univ. Calif., Davis 95616] The fish assemblage typical of small rainforest streams of Sri Lanka was investigated to see if the fishes were characterized by a high degree of specialization, expected of equilibrium communities, or if they were relatively unspecialized, expected of more stochastic (nonequilibrium) communities. Morphological features, habitats, microhabitats and diets of the 20 most abundant fish species were measured. The fishes included 11 Cyprinidae (including seven *Barbus* spp. and two *Rasbora* spp.), two Gobiidae, two Channidae, and one species each in the Cobitidae, Cyprinodontidae, Belontidae, Belonidae, and Mastacembelidae. Microhabitats were determined by measuring (for 6760 fish) water column depth, distance of fish from bottom, mean water column velocity, water velocity at fish, and substrate. Morphologically, the species showed a high degree of specialization, especially in structures related to feeding. Although several species were habitat generalists, most species occurred in distinct habitats. Within habitats, microhabitat overlap among co-occuring species was low, particularly in relation to position in the water column. Principal component analysis of the microhabitat measurements produced three new variables. Most species not clearly segregated by the overlap analysis showed segregation on the new variables. Fishes not segregated by habitat or microhabitat tended to show low dietary overlaps. Specialization in feeding habits was more pronounced among the Sri Lankan fishes than noted for fishes in small rainforest streams elsewhere, in part because of the greater reliance of the Sri Lanka fishes on autochthonous foods. Overall, the fish assemblage had the characteristics expected of an equilibrium (deterministic) assemblage.

FOODS/FEEDING (CONTINUED)

84-001290 Mwebaza-Ndawula, L. FOOD AND FEEDING HABITS OF *CLARIAS MOSSAMBICUS* FROM FOUR AREAS IN THE LAKE VICTORIA BASIN, EAST AFRICA. *Environ. Biol. Fishes* 10(1-2):69-76. 15 Feb. 1984. SFA 29(2)
[Inst. Mar. Sci., Univ. Dar Es Salaam, P.O. Box 668, Zanzibar, Tanzania]

84-001291 Newman, D. FOOD HABITS OF BLUEGILLS FROM HEATED AND UNHEATED AREAS OF COFFEEN LAKE. *Trans. Ill. Acad. Sci.* 76(3-4):253-263. 1983. SFA 29(2)
[Ill. Nat. Hist. Surv., Fox Ridge State Park, Charleston 61920] Food habits of bluegills collected from heated and unheated areas of Coffeen Lake were examined. Principal food items of bluegills from the heated station, in order of decreasing index of significance values, were plant material, terrestrial arthropods, gastropods, algae, and chironomids. A comparable list of principal food items from the unheated station included terrestrial arthropods, plant material, chironomids, other aquatic insects, and bryozoans. Diversity values, calculated to provide a qualitative assessment of feeding at heated and unheated locations, demonstrated that the diet of bluegills from the unheated station was consistently more diverse. Seasonal variations in diet reflected the bluegill's opportunistic feeding behavior, as seasonally abundant food resources (such as fish eggs, bryozoans, and terrestrial arthropods) were utilized as major food items. Other investigations have suggested that bluegills from heated locations feed more frequently than those from unheated waters. However, fullness indices calculated for this study indicated that stomach fullness was significantly higher at the heated station for only two of eight collection dates.

84-001292 Pati, S. FOOD AND FEEDING HABITS OF SILVER POMFRET *PAMPUS ARGENTEUS* (EUPHRASEN) FROM BAY OF BENGAL WITH A NOTE ON ITS SIGNIFICANCE IN FISHERY. *Indian J. Fish.* 27(1-2):244-256. 1980. SFA 29(2)
[Dep. Zool., Ravenshaw Coll., Cuttack 753003, India] A detailed study of the food and feeding habits of silver pomfret, *Pampus argenteus* (Euphrasen) was undertaken from Bay of Bengal along the Orissa coast. Copepod formed the main item in the diet followed by smaller jelly fishes and phytoplankters. A variety of smaller crustacea, polychaetes, fish eggs and fish-larvae occurred in minor quantities. The post-larvae feed on phytoplankton and a variety of zooplanktonic organisms are added to the diet during subsequent growth. The fish undertakes diurnal vertical migration in search of copepods, moving towards the surface after sunset and sinking to the bottom during the day time.

84-001293 Peck, David V. FOOD RESOURCE "CRUNCHES" AND FISH COMMUNITY STRUCTURE IN A SEASONALLY FLUCTUATING GREAT PLAINS STREAM. *Bull. Ecol. Soc. Am.* 64(2):105. June 1983. Abstract only. SFA 29(2)
[Univ. Okla., Norman] This study evaluates the importance of interspecific competition for food on fish community structure in the South Canadian River, Oklahoma. The river is characterized by substantial seasonal changes in flow and environmental conditions. Flow is reduced and environmental conditions become stressful in the fall. The dominant fishes are all "minnows" (3 *Notropis* spp. and *Gambusia affinis*. Relative densities of fish and food resources were monitored between April and October 1981 in a 120-m reach of stream. Results suggest that a resource "crunch" may occur during the fall of the year. The efficiency of foraging in a specific microhabitat should affect a species' success in the community during these periods. Laboratory tests of this hypothesis indicate a positive correlation between a species' foraging rate on benthic food items and its observed relative abundance. Frequent, seasonal episodes of competition may influence fish community structure in this type of stream.

FOODS/FEEDING (CONTINUED)

84-001294 Popova, O. A. and L. S'erra. FEEDING OF BLACK JACK, *CARANX RUBER* (CARANGIDAE), ON THE CUBAN SHELF IN THE GULF OF BATABANO. I. SEASONAL AND AGE-DEPENDENT DYNAMICS OF FEEDING. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):97-105. 1983. SFA 29(2)
[IEMEZH, Moscow, USSR]

84-001295 Powles, P. M.; H. R. MacCrimmon and D. A. Macrae. SEASONAL FEEDING OF CARP, *CYPRINUS CARPIO*, IN THE BAY OF QUINTE WATERSHED, ONTARIO. *Can. Field-Nat.* 97(3):293-298. July-Sept. 1983. SFA 29(2)
[Dep. Biol., Trent Univ., Peterborough, ON K9J 7B8, Canada] Observations from three areas and three seasons in 1977-78 suggest that Carp resident in the waters of the Bay of Quinte watershed are omnivorous, but primarily ingest invertebrate organisms. Feeding is curtailed but does not cease during the autumn and winter months. Plant materials make up a small part of digestive tract contents in the fall, changing to seeds in the winter. The presence of considerable debris during summer and fall suggest an active scouring of the substrate during feeding. A low incidence of plant materials in the digestive tract contents at any time of the year indicates a low nutritional dependence on aquatic plants. This suggests that, at present population densities, Carp are not a threat (in terms of direct ingestion) to indigenous aquatic plants though they may still act the role of a control species for many native macrophytes.

84-001296 Raisanen, G. A. and R. L. Applegate. PREY SELECTION OF WALLEYE FRY IN AN EXPERIMENTAL SYSTEM. *Prog. Fish-Cult.* 45(4):209-214. Oct. 1983. SFA 29(2)
[Mammoth Creek Fish Hatchery, Hatch, UT 84735]

84-001297 Rao, K. V. S. FOOD AND FEEDING OF LIZARD FISHES (*SAURIDA* SPP.) FROM NORTH WESTERN PART OF BAY OF BENGAL. *Indian J. Fish.* 28(1-2):47-64. 1981. SFA 29(2)
[Natl. Acad. Agric., Res. Manage., Hyderabad 500030, India] The food and feeding of *Saurida tumbil* was studied with reference to size of fish, time (seasonal and diurnal), regions (latitude zones), sex and maturity. Though there was not much difference in the composition of the food in respect of the above factors, variations were however, observed in the intensity of feeding. Fish formed the single major component (70 to 80%) of the food. The feeding intensity was low during the spawning period. Two peaks, one in the morning and the other in the noon, were observed in the feeding intensities according to time of day. The maturing fish had the highest feeding intensity. The values of Ivlev's index of electivity (E) for *Leiognathus bindus* were positive for 6 months and negative for 4 months. The results of studies on the food and feeding of *S. undosquamis* and *S. longimanus* are more or less similar.

84-001298 Sheridan, P. F. and D. L. Trimm. SUMMER FOODS OF TEXAS COASTAL FISHES RELATIVE TO AGE AND HABITAT. *NOAA Fish. Bull.* 81(3):643-647. July 1983. SFA 29(2)
[NMFS, 4700 Avenue U, Galveston, TX 77550]

84-001299 Sirajul Islam, A. K. M. and A. N. Khalaf. DIEL PATTERNS OF FEEDING OF KHISHNI *LIZA ABU* (HECKEL) IN RASHDIYAH RESERVOIR IN BAGHDAD, IRAQ. *Indian J. Fish.* 29(1-2):223-228. 1982. SFA 29(2)
[Biol. Res. Cent., Jadriyah, Baghdad, Iraq] A single 24-hour feeding cycle of *Liza abu* from Rashdiyah reservoir, Baghdad, Iraq, was studied. The guts of the fish contained food almost throughout the period and showed two

FOODS/FEEDING (CONTINUED)

84-001299 CONTINUED peaks - one at 0600 hours and the other at 2100 hours. Organic matter and detritus formed the major bulk of the diet, followed by diatoms, aquatic plant parts, nematodes, filamentous algae, copepods and aquatic insects. A total of 45 species of algae belonging to 29 genera were observed in the gut of the fish.

84-001300 Somasekharan Nair, K. V. FOOD AND FEEDING HABITS OF *JOHNIEOPS SINA* (CUVIER). *Indian J. Fish.* 27(1-2):24-34. 1980. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Kozhikode, India] The stomach contents of juvenile and adult *Johnieops sina* from the inshore fishing grounds off Calicut show no period of active feeding either in the juveniles or in the adults. In the food of juvenile, planktonic forms dominated: copepods being most predominant. The adult is carnivorous; fishes ranked first in the food followed by prawns, polychaetes, amphipods, *squilla* sp. and a variety of other organisms living at or near the bottom. The differences in the food composition between juveniles and adults suggest the two different habitats of the fish in the two stages.

84-001301 Stoner, A. W. and R. J. Livingston. ONTOGENETIC PATTERNS IN DIET AND FEEDING MORPHOLOGY IN SYMPATRIC SPARID FISHES FROM SEAGRASS MEADOWS. *Copeia* 1984(1):174-187. 23 Feb. 1984. SFA 29(2)
[Sea Educ. Assoc., P.O. Box 6, Woods Hole, MA 02543]

84-001302 Stouder, D. J. MICROHABITAT AND DIET SHIFTS WITHIN A GUILD OF TEMPERATE REEF SURFPERCHES: CONCLUSIONS. *Bull. Ecol. Soc. Am.* 64(2):91. June 1983. Abstract only. SFA 29(2)
[Univ. Calif., Santa Barbara]

84-001303 Sweatman, H. P. A. A FIELD STUDY OF THE PREDATORY BEHAVIOR AND FEEDING RATE OF A PISCIVOROUS CORAL REEF FISH, THE LIZARDFISH *SYNODUS ENGLEMANI*. *Copeia* 1984(1):187-194. 23 Feb. 1984. SFA 29(2)
[Cent. Environ. Urban Stud., Macquarie Univ., North Ryde, NSW 2113, Australia] Individual *Synodus englemani* are mobile hunters, feeding primarily on demersal, non-schooling fishes. They change their position approximately every 4 min, and are about equally active throughout the daytime, but stop hunting about 30 min before sunset. On average one fish is attacked every 35 min and 11% of attacks are successful. Lizardfish eat 1.8 prey per day (650 per year). The mean ratio of the estimated lengths of predators and prey is 36%, giving a mean daily food intake of 12% of predator body weight. Lizardfish are occasionally chased by other small piscivores and are often harassed by large individuals belonging to potential prey species. This latter behavior restricts the area in which lizardfish hunt.

84-001304 Tompkins, A. M. and J. H. Gee. FORAGING BEHAVIOR OF BROOK STICKLEBACK, *CULAEA INCONSTANS* (KIRTLAND): OPTIMIZATION OF TIME, SPACE, AND DIET. *Can. J. Zool.* 61(11):2482-2490. Nov. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-001305 Tonn, W. M. SIZE-LIMITED PREDATION, ENVIRONMENTAL DISTURBANCE AND THE *UMBRA-PERCA* INTERACTION. *Bull. Ecol. Soc. Am.* 64(2):90. June 1983. Abstract only. SFA 29(2)
[Univ. Wis., Madison]

FOODS/FEEDING (CONTINUED)

84-001306 Tucker, R. P. and S. P. Woolpy. THE EFFECT OF PARTHENOGENIC EGGS IN *DAPHNIA MAGNA* ON PREY LOCATION BY THE BLUEGILL SUNFISH *(LEPOMIS MACROCHIRUS). Hydrobiologia* 109(3):215-217. 29 Feb. 1984. SFA 29(2)

[Sch. Interdisciplin. Stud., Miami Univ., Oxford, OH 45056] The distance at which the bluegill sunfish (*Lepomis macrochirus*) can locate *Daphnia magna* with parthenogenic eggs is shown to be significantly greater than the reactive distance for non-gravid *Daphnia* of the same size. This difference is due to greater visibility of the gravid prey and not to different locomotor behavior, since there was no correlation between the number of eggs carried by a *Daphnia* and the antennal beat frequency. Based on this experiment and other observations, an explanation is given for selective predation of polymorphic cladoceran populations.

84-001307 Unger, P. A.; D. McClearn and W. M. Lewis, Jr. NONVISUAL PREY SELECTION BY A PLANKTIVOROUS FISH. *Bull. Ecol. Soc. Am.* 64(2):91. June 1983. Abstract only. SFA 29(2)

[Univ. Colo., Boulder] Studies of the diel feeding patterns of the planktivorous fish, *Xenomelaniris venezuelae*, in Lake Valencia, Venezuela, revealed that, although the fish is primarily a diurnal feeder, it often consumes substantial numbers of *Chaoborus* larvae and pupae at night. A number of fish species are known which feed on plankton at night, but these are filter feeders and their diets largely consist of relatively small, nonevasive prey. *Chaoborus* is a large and highly evasive prey. Nonvisual predation by *Xenomelaniris* was also studied experimentally. Captured fish were placed in completely darkened aquaria with zooplankton from Lake Valencia. After several hours the plankton or fish were removed and were examined for evidence of selective feeding. The fish were consistently found to select *Chaoborus* pupae and late instar larvae from the plankton. The mode of feeding by *Xenomelaniris* in the dark is unknown but the lateral-line system may be involved.

84-001308 Ward, G. and G. J. FitzGerald. FISH PREDATION ON THE MACROBENTHOS OF TIDAL SALT MARSH POOLS. *Can. J. Zool.* 61(6):1358-1361. June 1983. In English with French summ. SFA 29(2)

[Dep. Biol., Pavillon Vachon, Univ. Laval, Ste. Foy, PQ G1K 7P4, Canada]

84-001309 Wenderoff, L. TROPHIC COMPETITION BETWEEN THREESPINE STICKLEBACK (*GASTEROSTEUS ACULEATUS*) AND RAINBOW TROUT (*SALMO GAIRDNERI*) IN THREE LAKES IN THE MATANUSKA VALLEY, SOUTHCENTRAL ALASKA. *Proc. Alaska Sci. Conf.* 33:30. 1982. Abstract only. SFA 29(2)

[Alaska Dep. Fish Game, 333 Raspberry Rd., Anchorage 99502]

84-001310 Wilson, J. P. F. THE FOOD OF THE POLLAN, *COREGONUS AUTUMNALIS POLLAN* THOMPSON, IN LOUGH NEAGH, NORTHERN IRELAND. *J. Fish Biol.* 24(3):253-261. Mar. 1984. SFA 29(2)

[5 Riverview Grove, London W4, England] Stomach contents of pollan caught monthly throughout the year were examined. Stomach fullness was significantly correlated with water temperature. Adult pollan fed on bottom fauna, mainly chironomid larvae, in October-March, chironomid pupae in April and on *Daphnia* spp. in May-September. Immature (0+ and 1+) fish also ate other cladocerans and copepods. While there is no evidence for selection of any benthic prey species, adult pollan appear to be highly selective feeders on *Daphnia* spp. in summer.

FOODS/FEEDING (CONTINUED)

84-001311 Wolf, N. G. BEHAVIORAL ECOLOGY OF HERBIVOROUS REEF FISHES IN MIXED-SPECIES FORAGING GROUPS. *Ph.D. dissertation, Cornell Univ.* 161p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(9):2644. Mar. 1984. SFA 29(2)

84-001312 Wright, D. I. and W. J. O'Brien. THE DEVELOPMENT AND FIELD TEST OF A TACTICAL MODEL OF THE PLANKTIVOROUS FEEDING OF WHITE CRAPPIE *(POMOXIS ANNULARIS). Ecol. Monogr.* 54(1):65-98. Mar. 1984. SFA 29(2)
[Limnol. Res. Cent., 220 Pillsbury Hall, Univ. Minn., Minneapolis 55455]

AGE AND GROWTH

84-001313 Appa Rao, T. LENGTH-WEIGHT RELATIONSHIP IN *PENNAHIA MACROPTHALMUS* (BLEEKER) AND *JOHNIUS CARUTTA* (BLOCH). *Indian J. Fish.* 29(1-2):263-266. 1982. SFA 29(2)
[Waltair Res. Cent., Cent. Mar. Fish. Res. Inst., Waltair, India]

84-001314 Bartlett, J. R.; P. F. Randerson; R. Williams and D. M. Ellis. THE USE OF ANALYSIS OF COVARIANCE IN THE BACK-CALCULATION OF GROWTH IN FISH. *J. Fish Biol.* 24(2):201-213. Feb. 1984. SFA 29(2)
[Dep. Appl. Biol., UWIST, King Edward VII Ave., Cardiff, Wales]

84-001315 Bedford, B. C. A METHOD FOR PREPARING SECTIONS OF LARGE NUMBERS OF OTOLITHS EMBEDDED IN BLACK POLYESTER RESIN. *J. Cons. Cons. Inst. Explor. Mer* 41(1):4-12. Oct. 1983. SFA 29(2)
[Fish. Lab., Lowestoft, Suffolk NR33 OHT, England] A process is described in which otoliths are carefully positioned in rows in specially prepared moulds which are then filled with liquid black polyester resin. The resin hardens to form solid rectangular blocks with the otoliths embedded in them. The blocks are removed from the moulds and machined with a high-speed diamond saw. Thin slices are cut from the blocks precisely along the lines of the centres of the rows of otoliths. The slices are mounted and fixed on standard glass microscope slides. The otolith sections are then ready for reading. Up to 90 otoliths at a time may be processed in a single mould and the technique of positioning them is described. The setting up and machining of the blocks of polyester is also described as are the machine, moulds, and materials used. Comments are made on the extended range of possibilities for viewing the otolith sections produced by the method.

84-001316 Cech, J. J., Jr.; S. J. Mitchell; T. E. Wragg. COMPARATIVE GROWTH OF JUVENILE WHITE STURGEON AND STRIPED BASS: EFFECTS OF TEMPERATURE AND HYPOXIA. *Estuaries* 7(1):12-18. Mar. 1984. SFA 29(2)
[Wildl. Fish. Biol., Univ. Calif., Davis 95616] The influences of temperature and environmental hypoxia on the growth rates of two California anadromous fishes, white sturgeon (*Acipenser transmontanus*) and striped bass (Morone saxatilis) were examined. Fish (0.5-0.6g initial weight) were fed *ad libitum* rations of *Artemia* in flow-through aquaria regulated for temperature (15, 20, and 25°C) and oxygen tension (130 and 90 torr Po_2). Growth of sturgeon was significantly greater at 20°C compared with 15°C, but there was no difference between 20 and 25°C. Striped bass growth increased with each 5° increment of temperature elevation to 3.2% body weight per d at 25°C, the fastest growth rate measured. The temperature of maximum growth reflected the temperature of the native estuarine rearing area. Environmental hypoxia (90 torr Po_2) reduced growth of sturgeon within each temperature level, whereas striped bass growth was reduced by hypoxia only at the upper two temperatures. Sturgeon were much more active in the growth chambers than striped bass. Sturgeon activity increased with each

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84-001316 CONTINUED 5°C temperature increase under normoxia and hypoxia, except at 25°C (hypoxia) where activity was insignificantly different from that at 20°C (hypoxia).

84-001317 Chatterji, A.; M. Ali and A. Mumtaz. A NOTE ON THE LENGTH-WEIGHT RELATIONSHIPS OF KALBASU, *LABEO CALBAUSU* (HAM.). *Indian J. Fish.* 27(1-2):261-264. 1980. SFA 29(2)
[Natl. Inst. Oceanogr., Dona-Paula-403001, Goa, India]

84-001318 Chur, V. N. and V. L. Zharov. DETERMINATION OF AGE AND GROWTH RATE OF THE SKIPJACK TUNA, *KATSUWONUS PELAMIS* (SCOMBRIDAE), FROM THE SOUTHEASTERN PART OF THE GULF OF GUINEA. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):53-67. 1983. SFA 29(2)
[AtlantNIRO, Kaliningrad, USSR] Determination of age and growth rate of the skipjack tuna *Katsuwonus pelamis*, were made from cross sections of rays of the first dorsal fin. It is assumed that the reason for the periodicity of growth during the year may be variability of the food supply of the skipjack tuna. A size-age key is established and growth characteristics are presented. Age determination from cross sections of fin rays are confirmed by data from tagged tuna from the Pacific and Atlantic oceans.

84-001319 Coulston, P. J. and O. E. Maughan. AGE AND GROWTH OF TROUT FROM TWO LIGHTLY FISHED NORTH CAROLINA STREAMS. *J. Elisha Mitchell Sci. Soc.* 97(3):191-193. 1981. SFA 29(2)
[Ecological Analysts, Inc., Concord, CA 94521] In 1975-76 a study was undertaken on two North Carolina streams to evaluate whether management regulations accomplished the dual goal of permitting some harvest, yet insuring that enough fish are preserved for spawning. Two populations were studied: rainbow trout (*Salmo gairdneri*) and brown trout (*Salmo trutta*). Growth rates of both species were slow, but excessive harvest pressure was not evident. It appeared that most fish were removed from the population by natural mortality prior to reaching harvestable size. Further study of spawning size, fishing pressure and the possibility of promoting increased growth rates should precede any change in regulations.

84-001320 Dan, S. S. AGE AND GROWTH IN THE CATFISH *TACHYSURUS TENUISPINIS* (DAY). *Indian J. Fish.* 27(1-2):220-235. 1980. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Waltair, India]

84-001321 Devaraj, M. AGE AND GROWTH OF THREE SPECIES OF SEERFISHES *SCOMBEROMORUS COMMERSON*, *S. GUTTATUS* AND *S. LINEOLATUS*. *Indian J. Fish.* 28(1-2):104-127. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Mandapam Camp, India] Length frequency analysis indicates that the king seer (*Scomberomorus commerson*) attains a size of 402 mm, 726 mm, 995 mm and 1186 mm total length at 1, 2, 3, and 4 years of age, respectively, the streaked seer (*S. lineolatus*) reaches a size of 350 mm, 713 mm, 835 mm and 965 mm total length at 1, 2, 3 and 4 years, respectively, and the spotted seer (*S. guttatus*) a size of 369 mm, 532 mm and 640 mm at 1, 2, and 3 years, respectively. Back-calculated lengths of fish at the time of ring formation on otoliths agree closely with the results of length-frequency analysis. The maximum lengths of king seer, streaked seer and spotted seer met with in the catches are 1936 mm (33 kg), 980 mm (4.6 kg) and 705 mm (2.1 kg), respectively. The theoretical maximum lengths (L_∞) computed by Bagenal or Rafail method for the von

AGE AND GROWTH (CONTINUED)

84-001321 CONTINUED Bertalanffy growth equation are found to be 2081 mm (46.7 kg) for the king seer, 1683 mm (15.7kg) for the male streaked seer, 1447 mm (24.3kg) for the female streaked seer and 1278 mm (9.6 kg) for the spotted seer. All the three species develop two rings a year in their otoliths at a regular interval of six months. For all the three species, the exponent in the length-weight relationship is found to be close to 3.

84-001322 Diana, J. S. THE GROWTH OF LARGEMOUTH BASS, *MICROPTERUS SALMOIDES* (LACEPEDE), UNDER CONSTANT AND FLUCTUATING TEMPERATURES. *J. Fish Biol.* 24(2):165-172. Feb. 1984. SFA 29(2)

[Sch. Nat. Resour., Univ. Mich., Ann Arbor 48109] Growth of largemouth bass, *Micropterus salmoides*, was tested under constant (15°C,29°C) and cyclic (18 h at 15°C, 6H at 29°C) temperature conditions. Six groups of 10 fish each were tested; one group under each constant condition, and four groups in the thermocycles. The four latter groups differed in the timing of their feeding; one group each was fed at the start and middle of the warm and cool periods, respectively. All groups were fed to near-satiation. The fish fed at the start of the warm cycle and start cool group grew most rapidly, followed by the constant warm, mid warm, mid cool, and constant cool groups. These data were evaluated in relation to vertical migrations of fish to test the physiological enhancements that may be important to vertical migrations. Apparently thermocycles allow more rapid consumption of food than constant cool conditions and lower metabolic rates than constant warm conditions, which allows some fish to grow more rapidly under thermocycles than under constant conditions at either extreme of the cycle. However, the timing of feeding in relation to temperature in the thermocycle is important in the degree of growth enhancement.

84-001323 Fraser, J. M. LONGEVITY OF FIRST GENERATION SPLAKE. *Prog. Fish-Cult.* 45(4):233-234. Oct. 1983. SFA 29(2)

[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Box 50, Maple, ON LOJ 1E0, Canada]

84-001324 Jackson, D. C. and R. V. Kilambi. SELECTION OF SCALES FOR GROWTH ANALYSIS OF LARGEMOUTH BASS. *Proc. Ark. Acad. Sci.* 37:36-37. 1983. SFA 29(2)

[Dep. Zool., Univ. Ark., Fayetteville 72701] Scales from four regions of the body of largemouth bass were compared for efficacy in estimating fish length at the time of scale formation and at capture. The scales from above and below the lateral line in the pectoral and caudal peduncle regions yielded intercepts of 64.73, 52.36, 19.77 and 25.81 respectively for the total length-scale radius relationship. These intercept values represent the fish length at the time of scale formation. By the regression of estimated lengths of capture on empirical lengths it was found that the caudal peduncle scales were better suited in predicting fish length.

84-001325 Kunjipalu, K. K. and M. R. Boopendranath. NOTE ON THE CATCH OF A GIANT RAY *MANTA BIROSTRIS* (WALBAUM) OFF VERVAL, NORTH WEST COAST OF INDIA. *Indian J. Fish.* 28(1-2):278-280. 1981. SFA 29(2)

[Cent. Inst. Fish., Veraval-362265, India] A giant Devil Ray, *Manta birostris* (Walbaum), caught off Veraval has been described. The specimen measured 6800 mm (22 ft) across the disc and weighed 2 tons. The specimen's the largest ray so far reported from Indian waters.

AGE AND GROWTH (CONTINUED)

84-001326 Quick, A. J. R. and M. N. Bruton. AGE AND GROWTH OF *CLARIAS GARIEPINUS* (PISCES: CLARIIDAE) IN THE P.K. LE ROUX DAM, SOUTH AFRICA. *S. Afr. J. Zool.* 19(1):37-45. Jan. 1984. In English with Afrikaans summ. SFA 29(2) South Africa] Pectoral spines from 350 *Clarias gariepinus* from the P.K. le Roux Dam were sectioned near the distal end of the basal groove. There was a linear relationship between spine diameter and fish length. Of the spine sections 86% had clear growth checks, which were laid down annually in winter. Age and growth were boch-calculated from spine sections. No sexual dichotomy was found in growth. *C. garipinus* in the P.K. le Roux Dam have two growth stanzas, the first in fish <500-600mm and the second in fish >500-600mm. It is postulated that these stanzas may be caused by a switch in diet from invertebrates to fish, although the second stanza is probably accentuated by the methods used, which selected for faster growing, larger individuals. the length and mass frequency distribution, condition, size at sexual maturity and growth of *C. gariepinus* in the P.K. le Roux Dam are compared to those of *C. gariepinus* populations from other localities.

84-001327 Ralston, S. and G. T. Miyamoto. ANALYZING THE WIDTH OF DAILY OTOLITH INCREMENTS TO AGE THE HAWAIIAN SNAPPER, *PRISTIPOMOIDES FILAMENTOSUS*. *NOAA Fish. Bull.* 81(3):523-535. July 1983. SFA 29(2)

[NMFS, Honolulu, HI 96812] Studies of otolith microstructure in Hawaiian snapper, *Pristipomoides filamentosus*, indicate that growth increments are deposited daily in immature fish (<40 cm FL and <3 yr of age). Laboratory experiments with tetracycline-injected fish and analysis of modal progression in size-frequency distributions of field-sampled fish validate this conclusion. Given a 1:1 correspondence between increments and days, one can determine otolith growth rate by measuring increment width. Based on the relationship between otolith growth rate and otolith length, we conclude that increment deposition in mature *P. filamentosus* is episodic, i.e., interrupted. Using regression analysis, a model is developed relating otolith growth rate to otolith length. It is shown that integration of the regression equation provides estimates of the age of individual fish. Assumptions involved in the model are discussed, and it is concluded that this method of aging adequately represents the growth of *P. filamentosus* when time is measured on a scale of years. Age estimates derived here are entirely consistent with those of related forms (Luthanidae) reported in the literature.

84-001328 Robben, J. and D. T. Van den Audenaerde. A PRELIMINARY STUDY OF THE AGE AND GROWTH OF THE CYPRINID FISH *BARILIUS MOORII* BLGR. FROM LAKE KIVU. *Hydrobiologia* 108(2):153-163. 16 Jan. 1984. SFA 29(2)

[Zool. Inst., Katholieke Univ. Leuven, Naamsestraat 59, 3000-Leuven, Belgium]

84-001329 Said, M. Z. M. GROWTH AND MORTALITY OF THREADFIN FISH, *NEMIPTERUS PERONII* (VAL.) OFF THE COAST OF TRENGGANU, MALAYSIA. *Malay. Appl. Biol.* 12(2):31-36. Dec. 1983. SFA 29(2)

[Fac. Fish. Mar. Sci., Univ. Pertanian Malaysia, Serdang, Selangor, Malaysia] Length-frequency data of *Nemipterus peronii* were analysed for growth and mortality parameters using a computer-based programme (ELEFAN I and II). The parameters for growth are L_∞ = 284 mm (SL) and K = 0.342. The estimates of mortality are (Z) = 1.4, (M) = 0.9 and (F) = 0.5. The status of fishery is briefly discussed.

AGE AND GROWTH (CONTINUED)

84-001330 Sedov, S. I. and T. L. Rychagova. MORPHOLOGICAL CHARACTERISTICS OF ANCHOVY KILKA, *CLUPEONELLA ENGRAULIFORMIS* (CLUPEIDAE), IN WINTER AND SPRING. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):140-143. 1983. SFA 29(2)
[KaspNIRKH, Astrakhan, USSR]

84-001331 Seshappa, G. and B. K. Chakrapani. LENGTH-WEIGHT RELATIONSHIP OF *CYNOGLOSSUS LIDA* (BLEEKER). *Indian J. Fish.* 28(1-2):249-253. 1981. SFA 29(2)
[Cent. Inland Fish. Res. Inst., Bangalore-3, India]

84-001332 Sikstrom, C. B. OTOLITH, PECTORAL FIN RAY, AND SCALE AGE DETERMINATIONS FOR ARCTIC GRAYLING. *Prog. Fish-Cult.* 45(4):220-223. Oct. 1983. SFA 29(2)
[Esso Resour. Can. Ltd., 237-4th Ave. S.W., Calgary, AB T2P 0H6, Canada]

84-001333 Squire, J. L., Jr. WEIGHT FREQUENCIES FOR STRIPED MARLIN, *TETRAPTURUS AUDAX*, CAUGHT OFF SOUTHERN CALIFORNIA. *Mar. Fish. Rev.* 45(7-9):63-67. July-Sept. 1983. SFA 29(2)
[NMFS, La Jolla, CA 92038]

84-001334 Sreenivasan, P. V. AGE AND GROWTH OF THE SCAD *DECAPTERUS DAYI* WAKIYA. *Indian J. Fish.* 29(1-2):144-150. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin, India] *Decapterus dayi* Wakiya attains a length of 150 mm in the first year and 184 mm by 19 months at Vizhinjam. Maximum growth of 30 mm and 20 mm was noticed during the first and second months, respectively. Though many broods enter into the fishery in the same year, those born in April manifest strongly in the fishery than the earlier and later ones. The younger broods tend to catch up the older ones by faster growth and form a unimodal group at the size of 120-129 mm, and are found as a distinct unimodal size class then onwards. Adopting Walford's and Van Bertalanffy's equation to the data the various growth parameters obtained were: L_{∞} = 260 mm; T_o = -0.50; k = 0.1858 and L_{to} = 20 mm. The observed and calculated values were found to be in close agreement. Fishery is dependent on the 0-year class to the extent of 42.8% to 75.6%.

84-001335 Wakefield, C. A. and R. L. Colura. AGE AND GROWTH OF RED DRUM IN THREE TEXAS BAY SYSTEMS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:77-87. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Palacios 77465] Age and growth of red drum (*Sciaenops ocellatus*) in Lower Laguna Madre, Matagorda, and Galveston Bay systems in Texas were described using the scale method. One annulus was formed each year and annulus formation was completed by March or April. Growth was similar for fish in lower Laguna Madre and Matagorda Bay systems but Galveston Bay system fish had a larger L_{∞}. Calculated lengths at age I were similar to those reported by others, but shorter at later ages. The scale method was easily applied and shows potential, but requires additional validation before it can be used in red drum management programs.

84-001336 Walker, R. J. GROWTH OF YOUNG-OF-THE-YEAR SALMONIDS IN THE CHENA RIVER, ALASKA. *Proc. Alaska Sci. Conf.* 33:27. 1982. Abstract only. SFA 29(2)
[Alaska Coop. Fish. Res. Unit, Univ. Alaska, Fairbanks 99701]

AGE AND GROWTH (CONTINUED)

84-001337 Week, L. E. AGE AND GROWTH OF FLORIDA LARGEMOUTH BASS, *MICROPTERUS SALMOIDES FLORIDANUS*, IN HIDDEN VALLEY RESERVOIR, LAKE COUNTY, CALIFORNIA. *Calif. Fish Game* 70(1):59-60. Jan. 1984. SFA 29(2)
[Calif. Dep. Fish. Game, Reg. III Headquarters, P.O. Box 47, Yountville 94558]

84-001338 Wilson, J. P. F. and T. J. Pitcher. AGE DETERMINATION AND GROWTH OF THE POLLAN, *COREGONUS AUTUMNALIS POLLAN* THOMPSON, OF LOUGH NEAGH, NORTHERN IRELAND. *J. Fish Biol.* 24(2):151-163. Feb. 1984. SFA 29(2)
[5 Riverview Grove, London W4, England] Scales from Lough Neagh pollan display a large number of checks, making age determination difficult. Sclerite counts showed that an annual ckeck is formed on scales in May and a secondary accessory check in most young fish in October. The method of ageing from scales was supported by inspection of length-frequency plots and by following the growth of pollan in their first 2 years of life. The body-scale relationship was curvilinear. Back-calculation showed that pollan of both sexes attain a fork length of 29 cm in 5 years (l_∞=28.9 cm; k=0.65; t_0=-0.06 year). There is no evidence that annual growth rates have changed since 1965. Possible environmental causes of scale check formation are discussed.

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC.

84-001339 Ameer Hamsa, K. M. S. and G. Arumugam. A RECORD OF THE SNAKE MACKEREL *GEMPYLUS SERPANS* CUVIER FROM GULF OF MANNAR. *Indian J. Fish.* 29(1-2):255-257. 1982. SFA 29(2)
[Tuticorin Res. Cent., Cent. Mar. Fish. Res. Inst., Tuticorin, India]

84-001340 Baloni, S. P. FISH FAUNA OF KEDAR VALLEY, CHAMOLI-GARHWAL. *Indian J. Fish.* 27(1-2):10-16. 1980. SFA 29(2)
[Biol. Dep., Government Coll., Rudraprayag (Pauri-Garhwal), India]

84-001341 Bartels, C. E.; K. S. Price; M. I. López S. and W. A. Bussing. OCCURRENCE, DISTRIBUTION, ABUNDANCE AND DIVERSITY OF FISHES IN THE GULF OF NICOYA, COSTA RICA. *Riv. Biol. Trop.* 31(1):75-101. June 1983. In English with Spanish summ. SFA 29(2)
[Univ. Del. Coll. Mar. Stud., Lewes 19958]

84-001342 Campbell, R. N. and R. B. Williamson. SALMON AND FRESHWATER FISHES OF THE INNER HEBRIDES. *Proc. R. Soc. Edinb. Sect. B Biol. Sci.* 83:245-265. 1983. SFA 29(2)
[Nat. Conserv. Couns., Fraser Darling House, 9 Culduthel Rd. Inverness IV2 4AG, Scotland]

84-001343 Carter, F. A. and J. K. Beadles. RANGE EXTENSION OF THE SILVER CARP, *HYPOPHTHALMICHTHYS MOLITRIX*. *Proc. Ark. Acad. Sci.* 37:80. 1983. SFA 29(2)
[Ark. Game Fish Comm., No. 2 Natural Resources Dr., Little Rock 72205]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

84-001344 Carter, F. A. and J. K. Beadles. SICKLEFIN CHUB, *HYBOPSIS MEEKI*, IN THE MISSISSIPPI RIVER BORDERING ARKANSAS. *Proc. Ark. Acad. Sci.* 37:80. 1983. SFA 29(2)
[Ark. Game Fish Comm., No. 2 Natural Resources Dr., Little Rock 72205]

84-001345 Chester, A. J.; G. R. Huntsman; P. A. Tester and C. S. Manooch III. SOUTH ATLANTIC BIGHT REEF FISH COMMUNITIES AS REPRESENTED IN HOOK AND LINE CATCHES. *Bull. Ecol. Soc. Am.* 64(2):187. June 1983. Abstract only. SFA 29(2)
[NMFS, Beaufort, NC]

84-001346 Darcey, G. H. and E. J. Gutherz. ABUNDANCE AND DENSITY OF DEMERSAL FISHES ON THE WEST FLORIDA SHELF, JANUARY 1978. *Bull. Mar. Sci.* 34(1):81-105. Jan. 1984. SFA 29(2)
[NMFS, 75 Virginia Beach Dr., Miami, FL 33149-1099]

84-001347 Fago, D. DISTRIBUTION AND RELATIVE ABUNDANCE OF FISHES IN WISCONSIN. II. BLACK, TREMPEALEAU, AND BUFFALO RIVER BASINS. *Wis. Dep. Nat. Resour. Tech Bull.* No. 140. 120p. 1983. SFA 29(2)
[Wis. Dep. Nat. Res., 3911 Fish Hatchery Road, Madison 53711]

84-001348 Girijavallabhan, K. G. OCCURRENCE OF EGGS OF MYCTOPHIDAE IN THE SHELF REGION OFF MADRAS COAST. *Indian J. Fish.* 29(1-2):267-268. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Madras, India]

84-001349 Girijavallabhan, K. G. and J. C. Gnanamuttu. OCCURRENCE OF EGGS OF *STOLEPHORUS BATAVIENSIS* IN THE FISHING GROUNDS OFF MADRAS. *Indian J. Fish.* 29(1-2):269-270. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst. Cent., Madras, India]

84-001350 Held, J. W. FISHES OF NAVIGATION POOL NUMBER 7, UPPER MISSISSIPPI RIVER, I: LAKE ONALASKA. *Trans. Wis. Acad. Sci. Arts Lett.* 71(2):136-143. 1983. SFA 29(2)
[Dep. Biol., Univ. Wis., La Crosse]

84-001351 Held, J. W. FISHES OF NAVIGATION POOL NUMBER 7, UPPER MISSISSIPPI RIVER, II: THE RIVERINE PORTION. *Trans. Wis. Acad. Sci. Arts Lett.* 71(2):144-150. 1983. SFA 29(2)
[Dep. Biol., Univ. Wis., La Crosse]

84-001352 Hussain, S. M. and J. Ali-Khan. FISHES OF THE FAMILY CYNOGLOSSIDAE FROM PAKISTAN COAST. *Indian J. Fish.* 28(1-2):128-142. 1981. SFA 29(2)
[Inst. Mar. Biol., Univ. Karachi, Karachi-32, Pakistan]

84-001353 Lopez Cazorla, A. and R. C. Menni. PRESENCIA DE *MUSTELUS FASCIATUS* (GARMAN, 1913) EN BAHIA BLANCA, ARGENTINA (CHONDRICHTHYES, TRIAKIDAE). [ON THE PRESENCE OF *MUSTELUS FASCIATUS* (GARMAN, 1913) IN BAHIA BLANCA, ARGENTINA (CHONDRICHTHYES, TRIAKIDAE).] *Hist. Nat.* 3(13):137-140. 1983. In Spanish with English summ. SFA 29(2)
[Inst. Argentino Oceanogr. Avda. Alem 53, 8000, Bahía Blanca, Argentina]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

84-001354 Low, R. A. and G. F. Ulrich. DEEP-WATER DEMERSAL FINFISH RESOURCES AND FISHERIES OFF SOUTH CAROLINA. *S.C. Mar. Resour. Cent. Tech. Rep.* No. 57. i + 45p. Sept. 1983. SFA 29(2)
[S.C. Wildl. Mar. Resour. Dep., Charleston 29412]

84-001355 McLeod, C. L. and J. P. O'Neil. MAJOR RANGE EXTENSIONS OF ANADROMOUS SALMONIDS AND FIRST RECORD OF CHINOOK SALMON IN THE MACKENZIE RIVER DRAINAGE. *Can. J. Zool.* 61(9):2183-2184. Sept. 1983. In English with French summ. SFA 29(2)
[R.L. & L. Environ. Serv., Ltd., 17312-106 Ave., Edmonton, AB T5S 1H9, Canada]

84-001356 Mecum, R. D. HABITAT PREFERENCES OF FISHES IN THE TANANA RIVER NEAR FAIRBANKS, ALASKA. *Proc. Alaska Sci. Conf.* 33:17. 1982. Abstract only. SFA 29(2)
[Alaska Coop. Fish. Res. Unit, Univ. Alaska, Fairbanks 99701]

84-001357 Mohan, M. and G. Gopakumar. ON THE OCCURRENCE OF *NEMIPTERUS METOPIAS* (BLEEKER, 1852) (NEMIPTERIDAE, PISCES) FROM THE SOUTH WEST COAST OF INDIA. *Indian J. Fish.* 28(1-2):280-282. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Vizhinjam, India]

84-001358 Murawski, S. A.; A. M. Lange; M. P. Sissenwine and R. K. Mayo. DEFINITION AND ANALYSIS OF MULTISPECIES OTTER-TRAWL FISHERIES OFF THE NORTHEAST COAST OF THE UNITED STATES. *J. Cons. Cons. Inst. Explor. Mer.* 41(1):13-27. Oct. 1983. SFA 29(2)
[NMFS, Woods Hole Lab., Woods Hole, MA 02543]

84-001359 Nelson, J. S. THE TROPICAL FISH FAUNA IN CAVE AND BASIN HOTSPRINGS DRAINAGE, BANFF NATIONAL PARK, ALBERTA. *Can. Field-Nat.* 97(3):255-261. July-Sept. 1983. SFA 29(2)
[Dep. Zool., Univ. Alberta, Edmonton, AB T6G 3E9, Canada]

84-001360 Ojeda, F. P. DISTRIBUCIÓN LATITUDINAL Y BATIMÉTRICA DE LA ICTIOFAUNA DEMERSAL DEL EXTREMO AUSTRAL DE CHILE. [LATITUDINAL AND BATHYMETRIC DISTRIBUTION OF THE DEMERSAL ICHTHYOFAUNA OF SOUTHERN CHILE.] *Rev. Chilena Hist. Nat.* 56(1):61-70. July 1983. In Spanish with English summ. SFA 29(2)
[Lab. Zool., Pontif. Univ. Catol. Chile, Camilla 114-D, Santiago, Chile]

84-001361 Penczak, T.; R. Mahon and E. K. Balon. THE EFFECT OF AN IMPOUNDMENT ON THE UPSTREAM AND DOWNSTREAM FISH TAXOCENES (SPEED RIVER, ONTARIO, CANADA). *Arch. Hydrobiol.* 99(2):200-207. 1984. SFA 29(2)
[Univ. Lódzki, Zaklad Anat. Porównawczej Ekol. Zwiergat, Inst. Biol. Srodowiskowej, ul. A. Banacha 12/16, 90-237 Lódz, Poland]

84-001362 Phinney, G. and D. L. Rice. NEW RECORDS OF THE IOWA DARTER, *ETHEOSTOMA EXILE*, (PERCIDAE) IN OHIO. *Ohio J. Sci.* 84(1):67-70. Mar. 1984. SFA 29(2)
[Dep. Life Sci., Otterbein Coll., Westerville, OH 43081]

GEOGRAPHICAL DISTRIBUTION, FISH SURVEYS, ETC. (CONTINUED)

84-001363 Ratynski, R. A. MID-SUMMER ICHTHYOPLANKTON POPULATIONS OF TUKTOYAKTUK HARBOUR, N.W.T. *Can. Tech. Rep. Fish. Aquatic Sci.* No. 1218. iv + 21p. Dec. 1983. In English with French summ. SFA 29(2)
[Dep. Fish. Oceans, Winnipeg, MB R3T 2N6, Canada]

84-001364 Rey, A. C.; F. C. Monelos and J. G. Rivera. DATOS PROVISIONALES SOBRE LA DISTRIBUCION DE LOS CICLOSTOMOS Y PECES EN LAS AGUAS CONTINENTALES DE GALICIA. [PRELIMINARY DATA ON THE DISTRIBUTION OF CYCLOSTOMES AND FISH IN THE FRESH WATERS OF GALICIA.] *Bol. Estac. Cent. Ecol. (Madrid)* 11(21):49-54. 1982. In Spanish with English summ. SFA 29(2)
[Dep. Zool., Fac. Biol., Santiago, Spain]

84-001365 Romero, M. and J. Del Castillo. NUEVOS REGISTROS DE PECES DE LA FAMILIA MYCTOPHIDAE PARA AGUAS CUBANAS. [NEW RECORDS OF FISH OF THE FAMILY MYCTOPHIDAE FROM CUBAN WATERS.] *Poeyana* No. 261. 4p. Dec. 1983. In Spanish with English summ. SFA 29(2)
[Inst. Oceanol., Acad. Ciencias, Cuba]

84-001366 Shanmugavelu, C. R. and P. K. Mahadevan Pillai. ON THE RESULTS OF EXPLORATORY PURSE SEINING BETWEEN COCHIN AND GOA. *Indian J. Fish.* 27(1-2):183-192. 1980. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

84-001367 Sjöblom, V. SUOMEN KALAVARAT. [FISH RESOURCES IN FINLAND.] *Suom. Kalatalous* No. 51. p. 19-26. 1983. In Finnish with English summ. SFA 29(2)
[Helsingin Yliopisto, Limnol. Laitos, Viikki, 00710 Helsinki 71, Finland]

84-001368 Skelly, T. M. and M. J. Sule. THE PALLID SHINER, *NOTROPIS AMNIS* HUBBS AND GREENE, A RARE ILLINOIS FISH. *Trans. Ill. State Acad. Sci.* 76(1-2):131-138. 1983. SFA 29(2)
[Ill. Nat. Hist. Surv., 607 East Peabody Dr., Champaign 61280]

84-001369 Sturm, M. G. D. L. and G. D. Souza. *TRIPORTHEUS ELONGATUS*: A NEW RECORD OF A CHARACID FISH FROM TRINIDAD. *Copeia* 1984(1):262-263. 23 Feb. 1984. SFA 29(2)
[Inst. Mar. Affr., P.O. Box 3160, Carenage P.O., Trinidad, West Indies]

84-001370 Wheeler, A. and P. Clark. NEW RECORDS FOR THE OCCURRENCE OF *CRENILABRUS BAILLONI* (OSTEICHTHYES: PERCIFORMES: LABRIDAE) IN THE WATERS OF NORTHERN EUROPE. *J. Mar. Biol. Assoc. U. K.)* 64(1):1-6. Feb. 1984. SFA 29(2)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY

84-001371 Brown, A. F. and M. Diamond. THE CONSUMPTION OF RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON) EGGS BY MACROINVERTEBRATES IN THE FIELD. *Freshwater Biol.* 14(2):211-215. Apr. 1984. SFA 29(2)

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

84-001371 CONTINUED
[Dep. Zool., Univ. Liverpool, England] Perforated boxes containing live, dead or no eggs of the rainbow trout, *Salmo gairdneri* Richardson, were buried in a natural spawning redd in a stream in North Wales for the duration of the natural incubation period. A significant difference ($P<0.001$) was found between the mean number of invertebrates colonizing perforated boxes containing live eggs, dead eggs and no eggs. The number of eggs retrieved from boxes originally containing dead eggs decreased as the number of invertebrates colonizing the boxes increased. Using a serological method of prey identification it was demonstrated that *Leuctra hippopus* (Kempny), *Gammarus pulex* (L.) and Ptychopteridae sp. scavenged on trout eggs in the field. There was some evidence that *Rhyacophila doraslis* (Curtis) and *Diura bicaudata* (L.) preyed on trout eggs, but in view of their scarcity, it is suggested that they were a minor mortality factor.

84-001372 Buck, R. J. G. and D. W. Hay. THE RELATION BETWEEN STOCK SIZE AND PROGENY OF ATLANTIC SALMON, *SALMO SALAR* L., IN A SCOTTISH STREAM. *J. Fish Biol.* 24(1):1-11. Jan. 1984. SFA 29(2)
[D.A.F.S. Freshwater Fish. Lab., Pittochry, Scotland] Large variations in the number of female adult salmon spawning in the Girnock Burn each year (range 28-127) produced smaller variations each year (range 2900-5600) in the number of juvenile migrants. The relative constancy of the parr migrations was achieved by changes in their age composition. There may be no advantage in allowing ova deposition to exceed a level around 200 000 ($3.4m^{-2}$) in the Girnock Burn, which would give rise to an average of about 4000 juvenile migrants ($0.07m^{-2}$) per season. Large numbers of ova (up to $12.5m^{-2}$) did not decrease the number of juvenile migrants.

84-001373 Cambray, J. A. EARLY DEVELOPMENT AND LARVAL BEHAVIOUR OF A MINNOR, *BARBUS ANOPLUS* (PISCES: CYPRINIDAE). *S. Afr. J. Zool.* 18(4):331-336. Nov. 1983. In English with Afrikaans summ. SFA 29(2)
[Cape Dep. Nat. Environ. Conserv., Douglas Hey Limnol. Res. Stn., P.O. Box 23, Vanderkloof, 8771, South Africa] The chubbyhead barb, *Barbus anoplus*, underwent a population explosion in the early phases of filling Lake Le Roux on the Orange River. This successful colonization was possibly related to the survival strategy of the young stages of this minnow. It is suggested that some of the development traits of *B. anoplus* enabled it to become the most widespread freshwater fish species south of the Limpopo River. The development and behaviour of embryos and larvae of *B. anoplus* are described and discussed with reference to their survival strategy and potential colonizing ability. Some of the protolarvae were pelagic and the revelance of this behaviour is noted.

84-001374 Durocher, P. P.; W. C. Provine and J. E. Kraai. RELATIONSHIP BETWEEN ABUNDACNE OF LARGEMOUTH BASS AND SUBMERGED VEGETATION IN TEXAS RESERVOIRS. *N. Am. J. Fish. Manage.* 4(1):84-88. 1984. SFA 29(2)
[Tex. Parks Wildl. Dep., 4200 Smith School Rd., Austin, TX 78744]

84-001375 Giorgi, A. E. and J. L. Congleton. EFFECTS OF CURRENT VELOCITY ON DEVELOPMENT AND SURVIVAL OF LINGCOD, *OPHIODON ELONGATUS*, EMBRYOS. *Environ. Biol. Fishes* 10(1-2):15-27. 15 Feb. 1984. SFA 29(2)
[NMFS, 2725 Montlake Blvd. East, Seattle, WA 98112]

84-001376 Jones, G. P. POPULATION ECOLOGY OF THE TEMPERATE REEF FISH *PSEUDOLABRUS CELIDOTUS* BLOCH & SCHNEIDER (PISCES: LABRIDAE). I. FACTORS INFLUENCING RECRUITMENT. *J. Exp. Mar. Biol. Ecol.* 75(3):257-276. 1 Mar.

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

84-001376 CONTINUED 1984. SFA 29(2)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W. 2006, Australia]

84-001377 Jones, G. P. POPULATION ECOLOGY OF THE TEMPERATE REEF FISH *PSEUDOLABRUS CELIDOTUS* BLOCH & SCHNEIDER (PISCES: LABRIDAE). II. FACTORS INFLUENCING ADULT DENSITY. *J. Exp. Mar. Biol. Ecol.* 75(3):277-303. 1 Mar. 1984. SFA 29(2)
[Sch. Biol. Sci., Univ. Sydney, Sydney, N.S.W. 2006, Australia]

84-001378 Pati, S. and D. K. Pati. THE ROLE OF RAINFALL ON THE HILSA FISHERY ALONG THE ORISSA COAST. *Indian J. Fish.* 29(1-2):234-240. 1982. SFA 29(2)
[Dep. Zool., Ravenshaw Coll., Cuttack, Orissa, India]

84-001379 Schlosser, I. J. and L. A. Toth. NICHE RELATIONSHIPS AND POPULATION ECOLOGY OF RAINBOW (*ETHEOSTOMA CAERULEUM*) AND FANTAIL (*E. FLABELLARE*) DARTERS IN A TEMPORALLY VARIABLE ENVIRONMENT. *Oikos* 42(2):229-238. Jan. 1984. In English with Russian summ. SFA 29(2)
[Dep. Biol., Univ. N. Dak., Box 8238, University Station, Grand Forks 58202] We attempted to evaluate the importance of interspecific competition and fluctuations in stream flow in determining the relative abundance and spatial distribution of rainbow (*Etheostoma caeruleum*) and fantail (*E. flabellare*) darters. The species exhibited considerable overlap in prey size and taxa. The number of prey types utilized by each species increased in summer during periods of reduced resource availability. Fluctuations in prey availability had no effect on overlap in prey utilization. The species exhibited subtle differences in microhabitat use, with *E. caeruleum* foraging over the top surfaces of substrates and *E. flabellare* foraging in crevices between rocks. The distribution patterns of the species differed in substrate preference experiments but presence or absence of congeners did not influence substrate use. Microhabitat use appeared to be constrained by morphological characteristics of the species. The spatial distribution of *E. caeruleum* was more responsive to changes in flow conditions than *E. flabellare*, exhibiting a greater shift towards deeper habitats during low flows. *Etheostoma caeruleum* also exhibited greater temporal variability in population size than *E. flabellare* becuase of greater emigration and/or mortality of age I + individuals during low flow periods in late summer and autumn. These results suggest that in ecological time these species vary in their distribution and abundance independently of each other. Species specific responses to fluctuations in discharge, related to subtle differences in microhabitat use, appeared to be the critical ecological factor determining the relative abundance and spatial distribution of these species.

84-001380 Wang, J. C. S. NO. 15 ON THE ECOLOGICAL STATUS OF THE TIDEWATER GOBY, *EUCYCLOGOBIUS NEWBERRYI* (GIRARD), IN A LAGOON AND LAKE OF THE GOLDEN GATE NATIONAL RECREATION AREA, CA] *Univ. Calif. Inst. Ecol. Tech. Rep.* No. 15. 25p. Feb. 1984. SFA 29(2)
[23 Mountaire Court, Clayton, CA] Because the only place in the San Francisco Bay area where the tidewater goby has been found recently is Rodeo Lagoon, the lagoon and its artificially detached lake were sampled for small fishes in 1980, 1981, and 1982. A total of ten species of fish were observed in the lagoon and lake during 1980-1982, and some notes on their

ABUNDANCE, FACTORS OF; SURVIVAL AND MORTALITY (CONTINUED)

84-001380 CONTINUED ecological status in the lagoon are offered. Rodeo Lagoon provides all the necessities for survival of the tidewater goby, a native goby that has disappeared from the rest of San Francisco Bay, and is becoming increasingly uncommon in its entire distribution. For this reason, the tidewater goby population in Rodeo Lagoon desarves special protection in the Golden Gate National Recreation Area. The yellowfin goby, an introduced species thought to be a serious competitor of the tidewater goby, was also abundant in the lagoon in 1980, but its population declined drastically in 1981 and 1982, when the water in the lagoon was less saline. The life cycle of the tidewater goby can be completed at salinities of 5 ppt or less (although not in completely fresh water), but for yellowfin goby, reproduction is marginal at 5 ppt and unsuccessful below 5 ppt. It is recommended that salinity in Rodeo Lagoon be controlled to protect the tidewater goby.

IDENTIFICATION, KEYS, CLASSIFICATION

84-001381 Bath, H. *OMOBRANCHUS HIKKADUWENSIS* N. SP. VON CEYLON (PICES: BLENNIIDAE). *Senckenb. Biol.* 64(1-3):25-30. 30 Nov. 1983. In German with English summ. SFA 29(2)
[Luisenstr. 45, D-6780 Pirmasens, West Germany]

84-001382 Bianco, P. G. *LEUCISCUS LUCUMONIS* N. SP. FROM ITALY (PISCES: CYPRINIDAE). *Senckenb. Biol.* 64(1-3):81-87. 30 Nov. 1983. SFA 29(2)
[Ist. Zool., Piazza Regina Margherita 7, I-67100 L'Aquila, Italy]

84-001383 Bogdanov, V. D. SPECIES-SPECIFIC DIFFERENCES OF LARVAE OF SOME WHITEFISHES (COREGONINAE) AT HATCHING. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):86-96. 1983. SFA 29(2)
[Salekhard Res. Stn., Ural Res. Inst., Acad. Sci. USSR, Labytnangi, USSR]

84-001384 Bussing, W. A. A NEW TROPICAL EASTERN PACIFIC LABRID FISH, *HALICHOERES DISCOLOR* ENDEMIC TO ISLA DEL COCO, COSTA RICA. *Riv. Biol. Trop.* 31(1):19-23. June 1983. In English with Spanish summ. SFA 29(2)
[Esc. Biol., Univ. Costa Rica, Costa Rica]

84-001385 Bussing, W. A. *EVERMANNIA ERICI*, A NEW BURROWING GOBIID FISH FROM THE PACIFIC COAST OF COSTA RICA. *Riv. Biol. Trop.* 31(1):125-131. June 1983. In English with Spanish summ. SFA 29(2)
[Esc. Biol., Univ. Costa Rica, Costa Rica]

84-001386 Castle, P. H. J. and J. R. Paxton. A NEW GENUS AND SPECIES OF LUMINESCENT EEL (PISCES: CONGRIDAE) FROM THE ARAFURA SEA, NORTHERN AUSTRALIA. *Copeia* 1984(1):72-81. 23 Feb. 1984. SFA 29(2)
[Dep. Zool., Victoria Univ. Wellington, P. B., Wellington, New Zealand]

84-001387 Cheng, C. T. and Y. Wenhua. [A NEW SPECIES OF THE FAMILY SERRANIDAE-*EPINEPHELUS STIGMOGRAMMACUS*.] *Oceanol. Limnol. Sin.* 14(5):508. 1983. In Chinese with English summ. SFA 29(2)
[Inst. Oceanol., Acad. Sin., China]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-001388 Coad, B. W. *ACANTHOBRAMA CENTISQUAMA* HECKEL AND THE VALIDITY OF THE GENUS *MIROGREX* GOREN, FISHELSON AND TREWAVAS (OSTEICHTHYES: CYPRINIDAE). *Hydrobiologia* 109(3):275-278. 29 Feb. 1984. SFA 29(2)
[Ichthyol. Sect., Natl. Mus. Nat. Sci., Ottawa, ON K1A 0M8, Canada]

84-001389 Dingerkus, G. and T. C. DeFino. A REVISION OF THE ORECTOLOBIFORM SHARK FAMILY HEMISCYLLIDAE (CHONDRICHTHYES, SELACHII). *Bull. Am. Mus. Nat. Hist.* 176(1):1-93. 1983. SFA 29(2)
[Dep. Ichthyol., Am. Mus. Nat. Hist., New York, NY]

84-001390 Fricke, T. and H. Brunken. A NEW COTTID FISH OF THE GENUS *ANTIPODOCOTTUS* (TELEOSTEI: SCORPAENIFORMES) FROM EASTERN AUSTRALIA, WITH A KEY TO THE SPECIES OF THE GENERA *STLENGIS* AND *ANTIPODOCOTTUS*. *J. Nat. Hist.* 18(1):41-46. Jan.-Feb. 1984. SFA 29(2)
[Saalestr. 3a, D-3300 Braunschweig, West Germany]

84-001391 Hardy, G. S. A NEW GENUS AND SPECIES OF DEEPWATER CLINGFISH (FAMILY GOBIESOCIDAE) FROM NEW ZEALAND. *Bull. Mar. Sci.* 34(2):244-247. Mar. 1984. SFA 29(2)
[Natl. Mus. N. Z., P.B., Wellington, New Zealand]

84-001392 Heitmans, W. R. B.; H. Nijssen and I. J. H. Isbrücker. THE MAILED CATFISH GENUS *LASIANCISTRUS* REGAN, 1904, FROM FRENCH GUIANA AND SURINAM, WITH DESCRIPTIONS OF TWO NEW SPECIES (PISCES, SILURIFORMES, LORICARIIDAE). *Bijdr. Dierkd.* 53(1):33-48. 1983. In English with French summ. SFA 29(2)
[Inst. Taxon. Zool., Univ. Amsterdam, P.O. Box 20125, 1000 HC Amsterdam, Netherlands]

84-001393 Humphries, J. M., Jr. *CYPRINODON VERECUNDUS*, N. SP., A FIFTH SPECIES OF PUPFISH FROM LAGUNA CHICHANCANAB. *Copeia* 1984(1):58-68. 23 Feb. 1984. SFA 29(2)
[Mus. Zool., Univ. Mich., Ann Arbor 48109]

84-001394 Johnson, G. D. and P. Keener. AID TO IDENTIFICATION OF AMERICAN GROUPER LARVAE. *Bull. Mar. Sci.* 34(1):106-134. Jan. 1984. SFA 29(2)
[S.C. Mar. Resour. Res. Inst., P.O. Box 12559, Charleston 29412]

84-001395 Johnson, R. K. and R. M. Feltes. A NEW SPECIES OF *VICIGUERRIA* (SALMONIFORMES: PHOTICHTHYIDAE) FROM THE RED SEA AND GULF OF AQABA, WITH COMMENTS ON THE DEPAUPERACY OF THE RED SEA MESOPELAGIC FISH FAUNA. *Fieldiana Zool. New Ser.* No. 22. vi + 35p. 19 Feb. 1984. SFA 29(2)
[Dep. Zool., Field Mus. Nat. Hist., Chicago, IL]

84-001396 Kottelat, M. STATUS OF *LUCIOCYPRINUS* AND *FUSTIS* (OSTEICHTHYES: CYPRINIDAE). *Zool. Res.* 4(4):383-387. 1983. In English with Chinese summ. SFA 29(2)
[Naturhist. Mus., Augustinergasse 4, 4011 Basel, Switzerland]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-001397 López S., M. I. A NEW SPECIES OF CICHLID FISH, *CICHLASOMA RHYTISMA* FROM THE RÍO SIXAOLA DRAINAGE, COSTA RICA. *Riv. Biol. Trop.* 31(1):133-138. June 1983. SFA 29(2)
[Esc. Biol., Univ. Costa Rica, Costa Rica]

84-001398 Lal Mohan, R. S. AN ILLUSTRATED SYNOPSIS OF THE FISHES OF THE FAMILY SCIAENIDAE OF INDIA. *Indian J. Fish.* 28(1-2):1-24. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Calicut, India]

84-001399 McEachran, J. D. ANATOMICAL INVESTIGATIONS OF THE NEW ZEALAND SKATES *BATHYRAJA ASPERULA* AND *B. SPINIFERA*, WITH AN EVALUTATION OF THEIR CLASSIFICATION WITHIN THE RAJOIDEI (CHONDRICHTHYES). *Copeia* 1984(1):45-58. 23 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-001400 McKinley, D. HISTORY OF A NEGLECTED ACCOUNT OF THE PADDLEFISH, *POLYODON SPATHULA*. *Copeia* 1984(1):201-204. 23 Feb. 1984. SFA 29(2)
[Dep. Biol. Sci., State Univ. N. Y., Albany 12222] Although Lacepède established the genus *Polyodon* and wrote a lengthy account of the species now called *P. spathula* (Walbaum), its country of origin was unknown to him. Yet, in 1774, the French naturalist P. J. É. Mauduyt de la Varenne, had published in a widely read scientific journal an illustrated account of a small specimen of paddlefish brought from Louisiana by François LeBeau, colonial surgeon and botanist of the king. Mauduyt's illustration and a translation of his paddlefish account are reproduced herewith.

84-001401 Miquelarena, A. M. and R. C. Menni. SOBRE *SCHIZODON NASUTUS* KNER, 1858 (CHARACOIDEI, ANOSTOMIDAE). [ON *SCHIZODON NASUTUS* KNER, 1858 (CHARACOIDEI, ANOSTOMIDAE).] *Hist. Nat.* 3(19):177-180. 1983. In Spanish with English summ. SFA 29(2)
[Inst. Limnol., 1900 La Plata, Argentina]

84-001402 Murdy, E. O. and D. F. Hoese. THE MONOTYPIC GOBIID FISH GENUS *MACRODONTOGOBIUS*, INCLUDING SYNONYMIZATION OF *GNATHOLEPIS HENDERSONI*. *Copeia* 1984(1):227-229. 23 Feb. 1984. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843]

84-001403 Page, L. M. and B. M. Burr. THREE NEW SPECIES OF DARTERS (PERCIDAE, *ETHEOSTOMA*) OF THE SUBGENUS *NANOSTOMA* FROM KENTUCKY AND TENNESSEE. *Univ. Kans. Mus. Nat. Hist. Occas. Pap.* No. 101. p. 1-20. 18 June 1982. SFA 29(2)
[Ill. Nat. Hist. Surv., Champaign 61820]

84-001404 Parin, N. V. *APHANOPUS MIKHAILINI* SP. N. AND *A. INTERMEDIUS* SP. N. (TRICHIURIDAE, PERCIFORMES) TWO NEW SCABBARDFISHES FROM THE TEMPERATE WATERS OF THE SOUTHERN HEMISPHERE AND THE TROPICAL ATLANTIC. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):1-12. 1983. SFA 29(2)
[IOAN, Moscow, USSR]

IDENTIFICATION, KEYS, CLASSIFICATION (CONTINUED)

84-001405 Paulin, C. D. A REVISION OF THE FAMILY MORIDAE (PISCES: ANACANTHINI) WITHIN THE NEW ZEALAND REGION. *Natl. Mus. N.Z. Rec.* 2(9):81-126. 20 Jan. 1983. SFA 29(2)
[Natl. Mus. N.Z., Wellington, New Zealand]

84-001406 Pietsch, T. W. A REVIEW OF THE FROGFISH GENUS *RHYCHERUS* WITH THE DESCRIPTION OF A NEW SPECIES FROM WESTERN AND SOUTH AUSTRALIA. *Copeia* 1984(1):68-72. 23 Feb. 1984. SFA 29(2)
[Sch. Fish., Univ. Wash., Seattle 98195]

84-001407 Pietsch, T. W. THE GENERA OF FROGFISHES (FAMILY ANTENNARIIDAE). *Copeia* 1984(1):27-44. 23 Feb. 1984. SFA 29(2)
[Sch. Fish., Coll. Ocean Fish. Sci., Univ. Wash., Seattle 98195]

84-001408 Stewart, D. J. and T. R. Roberts. A NEW SPECIES OF DWARF CICHLID FISH WITH REVERSED SEXUAL DICHROMATISM FROM LAC MAI-NDOMBE, ZAÏRE. *Copeia* 1984(1):82-86. 23 Feb. 1984. SFA 29(2)
[Fish Div., Dep. Zool., Field Mus. Nat. Hist., Chicago, IL 60605]

84-001409 Taylor, J. N. and R. R. Miller. CICHLID FISHES (GENUS *CICHLASOMA*) OF THE RIO PANUCO BASIN, EASTERN MEXICO, WITH DESCRIPTION OF A NEW SPECIES. *Univ. Kans. Mus. Nat. Hist. Occas. Pap.* No. 104. p. 1-24. 1 Aug. 1983. SFA 29(2)
[Dep. Biol. Sci., Fla. Atl. Univ., Boca Raton 33431]

84-001410 Van Utrecht, W. L. *SAURENCHELYS HALIMYON*, A NEW SPECIES OF NETTASTOMID EEL, WITH COMMENTS ON *SAURENCHELYS CANCRIVORA* PETERS, 1864, AND A PRELIMINARY LIST OF LARVAL AND METAMORPHOSED ANGUILLIFORMES CAUGHT IN THE MID NORTH ATLANTIC. *Bijdr. Dierkd.* 53(2):227-232. 1983. In English with French summ. SFA 29(2)
[Inst. Taxon. Zool., Univ. Amsterdam, P.O. Box 20125, 1000 HC Amsterdam, The Netherlands]

84-001411 Williams, G. C.; R. K. Koehn and V. Thorsteinsson. ICELANDIC EELS: EVIDENCE FOR A SINGLE SPECIES OF *ANGUILLA* IN THE NORTH ATLANTIC. *Copeia* 1984(1):221-223. 23 Feb. 1984. SFA 29(2)
[Ecol. Evol., State Univ. N. Y., Stony Brook 11794]

84-001412 Williams, J. D. and D. A. Etnier. DESCRIPTION OF A NEW SPECIES, *FUNDULUS JULISIA*, WITH A REDESCRIPTION OF *FUNDULUS ALBOLINEATUS* AND A DIAGNOSIS OF THE SUBGENUS *XENISMA* (TELEOSTEI: CYPRINODONTIDAE). *Univ. Kans. Mus. Nat. Hist. Occas. Pap.* No. 102. p. 1-20. 27 June 1982. SFA 29(2)
[Off. Endangered Species, U.S. FWS, Washington, DC 20240]

84-001413 Yates, T. L.; M. A. Lewis and M. D. Hatch. BIOCHEMICAL SYSTEMATICS OF THREE SPECIES OF CATFISH (GENUS *ICTALURUS*) IN NEW MEXICO. *Copeia* 1984(1):97-101. 23 Feb. 1984. SFA 29(2)
[Univ. N. Mex., Dep. Biol., Albuquerque 87131] The discovery of a population of headwater catfish, *Ictalurus lupus* (Girard), in Dark Canyon, Guadalupe Mountains, New Mexico, prompted an allozymic assessment of the taxon's genic similarity to channel catfish, *I. punctatus* (Rafinesque), and black bullhead, *I. melas* (Rafinesque) from the state. The Dark Canyon *I. lupus* sample was found to differ by fixed differences

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84-001413 CONTINUED at eight loci (IPO, GOT-1, G-6-P, ES-1, PGI-2, PEP-A, PEP-E, PEP-F) when compared to *I. punctatus* from the San Francisco River. However, a sample of presumed *I. punctatus* taken from the Pecos River contained individuals with alleles characteristic of both species. Of 20 individuals examined from the Pecos River, five contained alleles characteristic of *I. lupus*, 14 contained alleles found in *I. punctatus*, and only one individual appeared to be a hybrid. The sympatric occurrence of these two forms in the Pecos River along with the apparent low level of hybridization observed suggests the species co-exist without significant introgression occurring. Both taxa thus merit full biological species status.

PARASITES AND DISEASES-GENERAL

84-001414 Blazer, V. S. and R. E. Wolke. THE EFFECTS OF α-TOCOPHEROL ON THE IMMUNE RESPONSE AND NON-SPECIFIC RESISTANCE FACTORS OF RAINBOW TROUT (*SALMO GAIRDNERI* RICHARDSON). *Aquaculture* 37(1):1-9. 15 Feb. 1984. SFA 29(2)
[Dep. Med. Microbiol., Coll. Vet. Med., Univ. Ga., Athens 30602] The effects of α-tocopherol on the specific immunity and non-specific resistance of fish were studied. Rainbow trout (*Salmo gairdneri*) were maintained on a control diet and an α-tocopherol deficient diet for 12-17 weeks. Fish in both experimental groups continued to grow, suffered no mortalities and showed no gross or histopathological signs of disease throughout the experiment. The specific immune reponse to sheep red blood cells (SRBC) and *Yersinia ruckeri* was monitored. Both T-cell (migration inhibition factor, MIF) and B-cell (plaque-forming cell, PFC) responses were assayed. Humoral immunity was measured by hemagglutination, hemolysin and bacterial agglutination. The non-specific factors assayed were total serum protein, serum globulin and the phagocytic index of peritoneal macrophages. Fish fed the α-tocopherol deficient diet had significantly reduced responses in almost all assays. Possible mechanisms for these effects as well as the ramifications of marginal α-tocopherol deficiencies to fish health are discussed. The possibility of immunopotentiation by vitamin E is also addressed.

84-001415 Bowser, P. R. and B. A. Evans. A BIBLIOGRAPY OF THE DISEASES AND PARASITES OF THE CHANNEL CATFISH (*ICTALURUS PUNCTATUS*, RAFINESQUE) 1974-1980. *Miss. Agric. For. Exp. Stn. Bull.* 924. 6p. Dec. 1983. SFA 29(2)
[Coll. Vet. Med., Miss. State Univ., Mississippi State 39762]

84-001416 Ghittino, P. and P. Bronzi. RICERCHE BATTERIOLOGICHE ED ISTOLOGICHE SULLE BRANCHIE DI PESCI INTENSIVAMENTE ALLEVATI. [BACTERIOLOGICAL AND HISTOPATHOLOGICAL RESERCHES ON GILLS OF INTENSIVELY REARED FISH.] *Riv. Ital. Piscic. Ittiop.* 18(3):118-127. July-Aug.-Sept. 1983. In Italian with English summ. SFA 29(2)
[Ist. Zooprof. Sper. Piemonte, Liguria e Valle d'Aosta, Via Bologna, 148, Torino, Italy]

84-001417 Ghittino, P. SIMPOSIO DELL'OFFICE INTERNATIONAL DES EPIZOOTIES (OIE) SULLE BASI TEORICHE E SUI RISULTATI PRATICI DELL'IMMUNIZZAZIONE DEI PESCI CONTRO LE MALATTIE INFETTIVE. [SYMPOSIUM OF THE OFFICE INTERNATIONAL

PARASITES AND DISEASES-GENERAL (CONTINUED)

84-001417 CONTINUED DES EPIZOOTIES (OIE) ON THEORETICAL BASIS AND PRACTICAL RESULTS OF IMMUNISATION OF FISH AGAINST INFECTIOUS DISEASES.] *Riv. Ital. Piscic. Ittiop.* 18(3):81-82. July-Aug.-Sept. 1983. In Italian and English. SFA 29(2)
[Via Lavazza, 46-10131 Torino, Italy]

84-001418 Griffin, B. R. and A. J. Mitchell. CHEMICAL RESISTANCE OF DISEASE ORGANISMS. *Proc. Fish Farm. Conf. Annu. Conv. Fish Farm. Tex.* 1983:94-100. 1983. SFA 29(2)
[U.S. FWS, P.O. Box 860, Stuttgart, AR 72160]

84-001419 Johnson, S. K. EXOTIC AQUATIC ANIMAL INTRODUCTIONS: DISEASE AGENTS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:9-10. 1983. Abstract only. SFA 29(2)
[Tex. Agric. Ext. Serv., College Station 77843]

84-001420 Meyers, T. MARINE BIVALVE MOLLUSCS AS RESERVOIRS OF FINFISH PATHOGENS: POTENTIAL SIGNIFICANCE TO MARINE AND ANADROMOUS FINFISH AQUACULTURE. *Proc. Alaska Sci. Conf.* 34:120. 1983. Abstract only. SFA 29(2)
[Sch. Fish. Sci., Univ. Alaska, Juneau]

84-001421 Sakai, D. K. THE ASSESSMENT OF THE HEALTH CONDITION OF SALMONIDS BY NON-SPECIFIC HAEMOLYTIC (SH_{50}) ACTIVITY OF SERUM. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1487-1491. Oct. 1983. SFA 29(2)
[Hokkaido Fish Hatchery, Nakanoshima 2, Toyohira, Sapporo 062, Japan] Normal salmonid sera were assayed for spontaneous haemolytic activity, SH_{50} activity, against washed goldfish red blood cells. When juvenile coho salmon *Oncorhynchus kisutch* and masu salmon *O. masou* were starved for 10 to 20 days and injected with *Aeromonas salmonicida* and *Vibrio anguillarum* intraperitoneally, a correlation between the decrease in the SH_{50} activity and the increase in severity of starvation and diseases was evidently represented. A similar correlation was followed by naturally diseased salmonids. The SH_{50} activity reflected the alteration in the state of health. Also, a considerable difference in the SH_{50} activity was shown by parr-smolt transformation of masou salmon. A possibility of the SH_{50} activity as a parameter of fish health assessment is discussed.

BACTERIAL DISEASES

84-001422 Aoki, T.; S. Takeshita and T. Kitao. ANTIBACTERIAL ACTION OF CHEMOTHERAPEUTIC AGENTS AGAINST NON-HEMOLYTIC *STREPTOCOCCUS* SP. ISOLATED FROM CULTURED MARINE FISH, YELLOWTAIL *SERIOLA QUINQUERADIATA*. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1673-1677. Nov. 1983. SFA 29(2)
[Dep. Fish., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

84-001423 Aoki, T.; T. Kitao; M. Fukudome; S. Takahasi and S. Egusa. MODIFICATION OF THE HYPEROSMOTIC INFILTRATION METHOD OF VACCINATION AGAINST VIBRIOSIS IN CULTURED AYU, *PLECOGLOSSUS ALTIVELIS* TEMMINCK AND SCHLEGEL.

BACTERIAL DISEASES (CONTINUED)

84-001423 CONTINUED *J. Fish Dis.* 7(2):149-156. Mar. 1984. SFA 29(2)
[Dep. Fish., Fac. Agric., Miyazaki Univ., Miyazaki 880, Japan]

84-001424 Bell, G. R.; D. A. Higgs and G. S. Traxler. THE EFFECT OF DIETARY ASCORBATE, ZINC, AND MANGANESE ON THE DEVELOPMENT OF EXPERIMENTALLY INDUCED BACTERIAL KIDNEY DISEASE IN SOCKEYE SALMON (*ONCORHYNCHUS NERKA*). *Aquaculture* 36(4):293-311. 1 Feb. 1984. SFA 29(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-001425 Dumont, P. MORTALITÉS, APRÈS ENSEMENCEMENT, D'OMBLES DE FONTAINE (*SALVELINUS FONTINALIS*) APPARTENANT À DES LOTS ATTEINTS DE FURONCULOSE. [MORTALITIES, AFTER STOCKING, OF BROOK CHARR (*SALVELINUS FONTINALIS*) STOCKED FROM LOTS AFFECTED WITH FURUCULOSIS.] *Nat. Can. (Que.)* 110(3):357-362. Dec. 1983. In French with English summ. SFA 29(2)
[Serv. Manage. Exploitation Faune, Minist. Loisir, Chasse Pêche, 6255 13e Ave., Montreal, PQ H1X 3E6, Canada] Three small lakes in south-western Québec were stocked with yearling brook charrs (*Salvelinus fontinalis*) taken from lots infected with an acute form of furuncolosis (caused by *Aeromonas salmonicida*). Mortality rate exceed 80% in two of these lakes two weeks after stocking, and 90% in the other lake 12 weeks after stocking. Summer growth was very slow. These mortality rates are much higher than those observed in lots raised in the hatchery and surpass the rates expected from a normal stocking.

84-001426 Garrison, R. L. SURVIVAL OF CHINOOK, COHO, AND STEELHEAD SMOLTS IMMUNIZED WITH A *VIBRIO ANGUILLARUM* BACTERIN BY ORAL OR SPRAY TREATMENTS. *Oreg. Dep. Fish. Wildl. Fish. Div. Inf. Rep.* No. 84-1. 11p. Feb. 1984. SFA 29(2)

84-001427 Ghittino, P.; S. Andruetto and A. Rosso. LA BOCCA ROSSA DA *YERSINIA RUCKERI* NATURALIZZATA NELLE TROTICOLTURE ITALIANE. [THE RED MOUTH BY *YERSINIA RUCKERI* IS NATURALISED IN ITALIAN TROUT FARMS.] *Riv. Ital. Piscic. Ittiop.* 18(4):129-130. Oct.-Nov.-Dec. 1983. SFA 29(2)

84-001428 Groman, D. B. STUDIES EXAMINING THE IDENTIFICATION, EPIZOOTIOLOGY AND CONTROL OF *RENIBACTERIUM SALMONINARUM* INFECTIONS IN CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*). *Ph.D dissertation, Univ. Idaho* 173p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(8):2291. Feb. 1984. SFA 29(2)

84-001429 Horne, M. T.; R. J. Roberts and M. Tatner. THE EFFECTS OF THE USE OF POTASSIUM ALUM ADJUVANT IN VACCINES AGAINST VIBRIOSIS IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 7(2):91-99. Mar. 1984. SFA 29(2)
[Inst. Aquacult., Univ. Stirling, Stirling FK9 4LA, Scotland] A formalized bacterin of *Vibrio anguillarum*, with and without alum adjuvant, was administered intraperitoneally to rainbow trout under farm conditions. Compared with the normal bacterin the adjuvanted preparation caused pathological changes indicative of chronic peritonitis, substantial early mortalities in 3 cm fish, and to a lesser extent in 20 cm fish, and depressed growth rate. No additional degree of protection aginst artificial challenge was obtained from its use.

BACTERIAL DISEASES (CONTINUED)

84-001430 Johnson, K. A. and D. F. Amend. POTENTIAL FOR IMMERSION VACCINATION AGAINST *AEROMONAS SALMONICIDA*. *J. Fish Dis.* 7(2):101-105. Mar. 1984. SFA 29(2)
[D.F. Amend: Dep. Med., Sch. Vet. Med., Univ. Calif., Davis 95616] The efficacy of the immersion method of vaccination was evaluated using *Aeromonas salmonicida* bacterin. In general a 2 min immersion vaccination was not as effective as vaccination by intraperitoneal injection; however, the level of immunity was improved by giving multiple vaccinations several days apart. A primary immersion vaccination with bacterin diluted 1:4 followed by a secondary booster vaccination diluted 1:2 gave good results. The most concentrated secondary booster was more effective than boosting with more dilute bacterin.

84-001431 Kimura, H. and R. Kusuda. [MICROBIAL SUCCESSION IN GLIDING BACTERIUM INFECTION IN RED SEA BREAM.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1553-1559. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Mar. Aquacult. Lab., Wakayama Pref., Tanabe, Wakayama 646, Japan]

84-001432 Kudo, S. and N. Kimura. THE RECOVERY FROM HYPERPLASIA IN A NATURAL INFECTION. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1627-1633. Nov. 1983. SFA 29(2)
[Dep. Anat., Gunma Univ. Sch. Med., Maebashi 371, Japan]

84-001433 Kudo, S. and N. Kimura. THE RECOVERY FROM HYPERPLASIA IN AN ARTIFICIAL INFECTION. *Bull. Jpn. Soc. Sci. Fish.* 49(11):1635-1641. Nov. 1983. SFA 29(4)
[Dep. Anat., Gunma Univ. Sch. Med., Maebashi 371, Japan]

84-001434 McCarthy, D. H.; T. R. Croy and D. F. Amend. IMMUNIZATION OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, AGAINST BACTERIAL KIDNEY DISEASE: PRELIMINARY EFFICACY EVALUATION. *J. Fish Dis.* 7(1):65-71. Jan. 1984. SFA 29(2)
[D. F. Amend: Dep. Med., Sch. Vet. Med., Univ. Calif., Davis 95616] A bacterin for immunization against bacterial kidney disease of salmonid fishes caused by *Renibacterium salmoninarum* is described. Cultures were grown in Evelyn's KDM2 medium containing 10% calf serum in a fermenter under the following conditions: pH 7.2, 15°C, 800 ml/min air, 200 rev/min agitation and 5-15 days of incubation. Possible substitutes for calf serum were 10% horse serum, 0.15% starch and leptospira medium. The bacterins were inactivated with 0.3% formalin and no adjuvants were used. Other tests evaluated pH-lysed bacterin, 50% concentrated bacterin and 50% concentrated pH-lysed bacterin. Juvenile rainbow trout, *Salmo gairdneri* Richardson, were vaccinated either by intraperitoneal (i.p.) injection, 2 min immersion or 2-step hyperosmotic infiltration. Fish were held from four to six weeks at 11°C, then challenged by i.p. injection with the homologous virulent bacterium. Fish died from days 19 to 40 after challenge. The best preparation was pH-lysed bacterin given by a single i.p. injection; hyperosmotic and immersion vaccination were not effective. Typically when 80% or more of unvaccinated controls were infected as detected by Gram stain, 10% or less of the vaccinated fish were infected.

84-001435 Paperna, I. and A. P. A. De Matos. THE DEVELOPMENTAL CYCLE OF EPITHELIOCYSTIS IN CARP, *CYPRINUS CARPIO* L. *J. Fish Dis.* 7(2):137-147. Mar. 1984. SFA 29(2)
[H. Steintz Mar. Biol. Lab., Hebrew Univ. Jerusalem, P.O.B. 469, Eilat 88103, Israel]

BACTERIAL DISEASES (CONTINUED)

84-001436 Ransom, D. P.; C. N. Lannan; J. S. Rohovec and J. L. Fryer. COMPARISON OF HISTOPATHOLOGY CAUSED BY *VIBRIO ANGUILLARUM* AND *VIBRIO ORDALII* IN THREE SPECIES OF PACIFIC SALMON. *J. Fish Dis.* 7(2):107-115. Mar. 1984. SFA 29(2)
[Oreg. Aquafoods, 88700 Marcola Rd., Springfield, OR 97477]

84-001437 Rasheed, V. and J. A. Plumb. PATHOGENICITY OF NON-HAEMOLYTIC GROUP-B *STREPTOCOCCUS* SP. IN GULF KILLIFISH (*FUNDULUS GRANDIS* BAIRD AND GIRARD). *Aquaculture* 37(2):97-105. 1 Mar. 1984. SFA 29(2)
[Kuwait Inst. Sci. Res., Maricult. Fish. Dep., P.O. Box 1638, Salmiya, Kuwait]

PROTOZOAN DISEASES

84-001438 Bower, S. M. and L. Margolis. DIRECT TRANSMISSION OF THE HAEMOFLAGELLATE *CRYPTOBIA SALMOSITICA* AMONG PACIFIC SALMON (*ONCORHYNCHUS* SPP.). *Can. J. Zool.* 61(6):1242-1250. June 1983. SFA 29(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-001439 Cone, D. K. and M. Wiles. *ICHTHYOBODO NECATOR* (HENNEGUY, 1883) FROM WINTER FLOUNDER, *PSEUDOPLEURONECTES AMERICANUS* (WALBAUM), IN THE NORTH-WEST ATLANTIC OCEAN. *J. Fish Dis.* 7(1):87-89. Jan. 1984. SFA 29(2)
[M. Wiles: Dep. Biol., St. Mary's Univ., Halifax, NS B3H 3C3, Canada]

84-001440 Csaba, G.; É. Kovács-Gayer; L. Békési; M. Bucsek; J. Szakolczai and K. Molnár. STUDIES INTO THE POSSIBLE PROTOZOAN AETIOLOGY OF SWIMBLADDER INFLAMMATION IN CARP FRY. *J. Fish Dis.* 7(1):39-56. Jan. 1984. SFA 29(2)
[Cent. Vet. Inst., H-1143 Budapest, Tábornok u.2, Hungary] Laboratory examinations of pond-reared common carp, *Cyprinus carpio* L., revealed a close correlation between the prevalence of swimbladder inflammation (SBI), renal sphaerosporosis and infection by C-blood protozoan among the carp fry. In impression smears as well as light and electron microscopic preparations we detected developmental stages of intercellular protozoa, mainly in the loose fibrous tissue of the swimbladder. The parasites multiplied by internal budding so that 20-46 secondary cells were formed in each primary cell and two tertiary cells were formed in each secondary cell. The final stage of development was a unit consisting of a secondary cell enclosing two tertiary cells, i.e. a so-called triple formation, which bore a close resemblance to the early sporogonic stages of the renal sphaerosporan *Spaerospora angulata* Fujita, 1912. Certain morphological similarities and the frequent simultaneous presence of the swimbladder protozoan, C-blood-protozoan, and *S. angulata* in hosts with clinical SBI have led us to postulate that the former two parasties could represent the hitherto unknown presporogonic stages of *S. angulata*. In view of the pathological changes caused by the parasites in the hosts with clinical SBI, and negative bacteriological anc virological findings we have postulated that the swimbladder protozoan is the primary cause of SBI in carp fry.

PROTOZOAN DISEASES (CONTINUED)

84-001441 Jastrzebski, M. NEW SPECIES OF INTESTINAL COCCIDIA IN FRESHWATER FISH. *Bull. Acad. Pol. Sci. Ser. Sci. Biol.* 30(1-12):7-11. 1982. SFA 29(2)
[Dep. Parasitol. Parasitic Dis., Vet. Fac., Agric. Univ., Grochowska 272, 03-849 Warsaw, Poland]

84-001442 Li, L. and S. S. Desser. *TRICHODINA ALGONQUINENSIS*, A NEW SPECIES OF PERITRICH CILIATE FROM ONTARIO FRESHWATER FISH, AND OBSERVATIONS ON ITS TRANSMISSION. *Can. J. Zool.* 61(5):1159-1164. May 1983. In English with French summ. SFA 29(2)
[Inst. Hydrobiol., Chinese Acad. Sci., China]

84-001443 McDonald, T. E. *CERTOMYXA SHASTA* NOBLE, 1950 (MYXOZOA: MYXOSPOREA) PRESENT IN THE FRASER RIVER SYSTEM OF BRITISH COLUMBIA. *Can. J. Zool.* 61(9):1991-1994. Sept. 1983. In English with French summ. SFA 29(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-001444 Morrison, C. M. THE DISTRIBUTION OF THE MICROSPORIDIAN *LOMA MORHUA* IN TISSUES OF THE COD *GADUS MORHUA* L. *Can. J. Zool.* 61(9):2155-2161. Sept. 1984. In English with French summ. SFA 29(2)
[Halifax Lab., P.O. Box 550, Halifax, NS B3J 2S7, Canada]

VIRAL DISEASES

84-001445 Bernstein, J. W. LEUKAEMIC LYMPHOSARCOMA IN A HATCHERY-REARED RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 7(1):83-86. Jan. 1984. SFA 29(2)
[Dep. Vet. Pathol., Western Coll. Vet. Med., Univ. Saskatchewan, SK S7N 0W0, Canada]

84-001446 Faisal, M. and W. Ahne. SPRING VIRAEMIA OF CARP VIRUS (SVCV): COMPARISON OF IMMUNOPEROXIDASE, FLUORESCENT ANTIBODY AND CELL CULTURE ISOLATION TECHNIQUES FOR DETECTION OF ANTIGEN. *J. Fish Dis.* 7(1):57-64. Jan. 1984. SFA 29(2)
[W. Ahne: Inst. Zool. Hydrobiol., Univ. München, Kaulbachstr. 37, 8 München 22, West Germany]

84-001447 Fournie, J. W. and R. M. Overstreet. TRUE INTERMEDIATE HOSTS FOR *EIMERIA FUNDULI* (APICOMPLEXA) FROM ESTUARINE FISHES. *J. Protozool.* 30(4):672-675. Nov. 1983. SFA 29(2)
[Gulf Coast Res. Lab., Ocean Springs, MS 39564]

84-001448 Ishiguro, S.; H. Izawa; H. Kodama; M. Onuma and T. Mikami. SEROLOGICAL RELATIONSHIPS AMONG FIVE STRAINS OF INFECTIOUS PANCREATIC NECROSIS VIRUS. *J. Fish Dis.* 7(2):127-135. Mar. 1984. SFA 29(2)
[H. Izawa: Dep. Epizootiol., Fac. Vet. Med., Hokkaido Univ., Sapporo, Japan]

VIRAL DISEASES (CONTINUED)

84-001449 Reiersen, L. and K. Fugelli. ANNUAL VARIATION IN LYMPHOCYSTIS INFECTION FREQUENCY IN FLOUNDER, *PLATICHTHYS FLESUS* (L.) *J. Fish Biol.* 24(2):187-191. Feb. 1984. SFA 29(2)
[Inst. Mar. Biol. Limnol., Univ. Oslo, Oslo, Norway]

84-001450 Warr, G. W.; B. R. Griffin; D. P. Anderson; P. E. McAllister; B. Lidgerding and C. E. Smith. A LYMPHOSARCOMA OF THYMIC ORIGIN IN THE RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON. *J. Fish Dis.* 7(1):73-82. Jan. 1984. SFA 29(2)
[Dep. Biochem., Med. Univ. S. C., 171 Ashley Ave., Charleston 29425] A rainbow trout with a malignant lymphoma of probable thymic origin showed direct spread of the tumour to the gills, metastases to the liver and head kidney, and the presence of abnormal circulating lymphocytes. The cells of the tumour possessed plasma membrane immunoglobulin detectable by immunofluorescence. Examination of the tumour cells by transmission electron microscopy revealed no evidence of virus associated with the cells. Infectious viruses could not be detected in the tumour tissue, and the tumour was not transmissible by injection of live tumour cells into young rainbow trout. Attempts to establish the tumour in long-term culture were unsuccessful.

84-001451 Williams, E. H.; L. B. Williams and J. M. Grizzle. LYMPHOCYSTIS FROM WEST INDIAN MARINE FISHES. *J. Wildl. Dis.* 20(1):51-52. Jan. 1984. SFA 29(2)
[Dep. Mar. Sci., Univ. Puerto Rico, Mayaguez 00708]

OTHER DISEASES AND PARASITES

84-001452 Ali, N. M. MAST CELLS ENTER A TELEOST'S BRAIN BY XTH CRANIAL NERVE IN RESPONSE TO *DIPLOSTOMUM PHOXINI* (TREMATODA). *Experientia (Basel)* 40(2):197-198. 15 Feb. 1984. SFA 29(2)
[Dep. Zool., Univ. Coll. Wales, Aberystwyth, Dyfed SY23 3DA, Wales]

84-001453 Amin, O. M. CAMALLANID AND OTHER NEMATODE PARASITES OF LAKE FISHES IN SOUTHEASTERN WISCONSIN. *Proc. Helminthol. Soc. Wash.* 51(1):78-84. Jan. 1984. SFA 29(2)
[Univ. Wis., Box 2000, Kenosa 53141]

84-001454 Avdeev, V. V. PECULIARITIES OF GEOGRAPHICAL DISTRIBUTION OF FRESH-WATER ISOPODS OF THE FAMILY CYMOTHOIDAE WITH REFERENCE TO THE ORIGIN OF THE CYPRINIFORMES. *Zool. Zh.* 63(1):34-41. Jan. 1984. In Russian with English summ. SFA 29(2)
[Pac. Res. Inst. Mar. Fish. Oceanogr., Vladivostok, USSR]

84-001455 Blair, D. LARVAL HORSEHAIR WORMS (NEMATOMORPHA) FROM THE TISSUES OF NATIVE FRESHWATER FISH IN NEW ZEALAND. *N. Z. J. Zool.* 10(4):341-344. 1983. SFA 29(2)
[Dep. Zool., Univ. Canterbury, Christchurch, New Zealand]

84-001456 Bowser, P. R.; R. Toal; H. R. Robinette and M. W. Brunson. COELOMIC DISTENTION IN CHANNEL CATFISH FINGERLINGS. *Prog. Fish-Cult.* 45(4):208-209. Oct. 1983. SFA 29(2)
[Coll. Vet. Med., Miss. State Univ., Mississippi State 38762]

OTHER DISEASES AND PARASITES (CONTINUED)

84-001457 Bray, R. A. SOME HELMINTH PARASITES OF MARINE FISHES AND CEPHALOPODS OF SOUTH AFRICA: ASPIDOGASTREA AND THE DIGENEAN FAMILIES BUCEPHALIDAE, HAPLOSPLANCHNIDAE, MESOMETRIDAE AND FELLODISTOMIDAE. *J. Nat. Hist.* 18(2):271-292. Mar.-Apr. 1984. SFA 29(2)
[Dep. Zool., Br. Mus. (Nat. Hist.), Cromwell Rd., London SW7 5BD, England]

84-001458 Burreson, E. M. A NEW SPECIES OF MARINE LEECH (HIRUNDINEA: PISCICOLIDAE) FROM THE NORTH-EASTERN PACIFIC OCEAN, PARASITIC ON THE ENGLISH SOLE, *PAROPHRYS VETULUS* GIRARD. *Zool. J. Linn. Soc.* 80(2-3):297-301. Feb.-Mar. 1984. SFA 29(2)
[Va. Inst. Mar. Sci., Coll. William and Mary, Gloucester Point, VA 23062]

84-001459 Carmichael, G. J. SWIM BLADDER STRESS SYNDROME IN LARGEMOUTH BASS. *Tex. J. Sci.* 35(4):315-321. Jan. 1984. SFA 29(2)
[U.S. FWS, Natl. Fish Hatchery Dev. Cent., San Marcos, TX 78666] Overinflated swim bladders were observed in largemouth bass (*Micropterus salmoides*) after handling and short-term transport. The affected fish swam near the surface with their backs exposed and, in some cases, became inverted and later died. Plasma corticosteroid concentrations of these fish were above normal levels while plasma chloride concentrations and plasma osmolality were below normal levels. Changes in these plasma characteristics are indicative of acute handling-induced types of stress in largemouth bass. It is suggested that some physiological response to physical disturbance may increase the deposition of gas from the blood into the swim bladder.

84-001460 Chambrier, A. and C. Vaucher. *PROTEOCEPHALUS GASPARI* N. SP. (CESTODA: PROTEOCEPHALIDAE), PARASITE DE *LEPISOSTEUS TROPICUS* (GILL) AU LAC MANAGUA (NICARAGUA). [*PROTEOCEPHALUS GASPARI* N. SP. (CESTODA: PROTEOCEPHALIDAE) PARASITE OF *LEPISOSTEUS TROPICUS* (GILL) FROM LAKE MANAGUA (NICARAGUA).] *Rev. Suisse Zool.* 91(1):229-233. 1984. SFA 29(2)
[Mus. Hist. Nat., C.P. 434, 1211 Geneva 6, Switzerland]

84-001461 Ching, J. L. and K. Andersen. DESCRIPTION OF *EUBOTHRIUM TULIPAI* SP. N. (PSEUDOPHYLLIDEA: AMPHICOTYLIDAE) FROM NORTHERN SQUAWFISH IN BRITISH COLUMBIA. *Can. J. Zool.* 61(5):981-986. May 1983. In English with French summ. SFA 29(2)
[Environ. Ltd., 300 475 West Georgia St., Vancouver, BC V6B 4M9, Canada]

84-001462 Collins, M. R. *HATSCHEKIA OBLONGA* (COPEPODA, CALIGOIDA) FROM YELLOWTAIL SNAPPER (*OCYURUS CHRYSURUS*) IN THE FLORIDA KEYS. *J. Wildl. Dis.* 20(1):63-64. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Fla., Gainesville 32611]

84-001463 Cone, D. K. and M. Wiles. A REDESCRIPTION OF *GYRODACTYLUS GURLEYI* PRICE, 1937 (MONOGENEA), WITH NOTES ON SPECIES OF *GYRODACTYLUS* NORDMANN, 1832 PARASITIZING GOLDFISH (*CARASSIUS AURATUS* (L.)) IN NORTH AMERICA. *Can. J. Zool.* 61(12):2932-2937. Dec. 1983. In English with French summ. SFA 29(2)
[Dep. Biol., Saint Mary's Univ., Halifax, NS B3H 3C3, Canada]

84-001464 Cone, D. K.; M. Beverley-Burton; M. Wiles and T. E. McDonald. THE TAXONOMY OF *GYRODACTYLUS* (MONOGENEA) PARASITIZING CERTAIN SALMONID FISHES OF NORTH AMERICA, WITH A DESCRIPTION OF *GYRODACTYLUS NERKAE* N. SP.

OTHER DISEASES AND PARASITES (CONTINUED)

84-001464 CONTINUED *Can. J. Zool.* 61(11):2587-2597. Nov. 1983. In English with French summ. SFA 29(2)
[Biol. Dep., Saint Mary's Univ., Halifax, NS B3H 3C3, Canada]

84-001465 Cornacchia, J. W. and J. E. Colt. THE EFFECTS OF DISSOLVED GAS SUPERSATURATION ON LARVAL STRIPED BASS, *MORONE SAXATILIS* (WALBAUM). *J. Fish Dis.* 7(1):15-27. Jan. 1984. SFA 29(2)
[J. E. Colt: Teufel and Assoc., 1303 Lake Blvd., Davis, CA 95616] Gas bubble disease in larval striped bass, *Morone saxatilis* (Walbaum), was characterized by overinflation of the swimbladder and the formation of intestinal bubbles. This accumulation of gas hindered normal swimming of the fish and in extreme cases resulted in floating fish. As gas accumulated in the gut, the inner mucosal lining was compressed down into a cuboidal epithelium and in more advanced cases nearly the entire digestive tract was reduced to a squamous inner epithelium surrounded by a thin serosa. A significant increase in swimbladder volume was observed at total gas pressures as low as 102.9% and mortality was increased at 105.6-106.0%. The older larvae (30-day-old) were less sensitive to gas supersaturation than 10- to 19-day-old larvae.

84-001466 Font, W. F. SEASONAL POPULATION DYNAMICS OF FIVE SPECIES OF INTESTINAL HELMINTHS OF THE BROOK STICKLEBACK, *CULAEA INCONSTANS*. *Can. J. Zool.* 61(9):2129-2137. Sept. 1983. In English with French summ. SFA 29(2)
[Dep. Biol., Univ. Wis., Eau Claire 54701]

84-001467 George-Nascimento, M. A.; J. G. Carvajal and H. C. Alcaino. OCCURRENCE OF *ANISAKIS* SP. LARVAE IN THE CHILEAN JACK MACKEREL, *TRACHURUS MURPHYI* NICHOLS 1920. *Rev. Chilena Hist. Nat.* 56(1):31-37. July 1983. In English with Spanish summ. SFA 29(2)
[Dep. Biol. Tecnol. Mar, Ponti. Univ. Catol. Chile, Sede Talcahuano, Casilla 127, Talcahuano, Chile]

84-001468 Giavenni, R. PARASSITOSI SOSTENUTA DA *DIPLECTANUM AEQUANS* (WAGENER 1857) DIESING 1858 IN BRANZINO (*DICENTRARCHUS LABRAX* L.) DI ALLEVAMENTO. [INFESTATION BY *DIPLECTANUM AEQUANS* (WAGENER 1857) DIESING 1858 IN CULTURED SEA BASS (*DICENTRARCHUS LABRAX* L.).] *Riv. Ital. Piscic. Ittiop.* 18(4):167-176. Oct.-Nov.-Dec. 1983. In Italian with English summ. SFA 29(2)
[Med. Vet., S.I.R.A.P., Via Murazzi 1238, 30010 Pellestrina, Italy]

84-001469 Hayunga, E. G. ANATOMICAL ANOMALIES IN A LEECH, *CYSTOBRANCHUS MEYERI* (HIRUNDINEA: PISCICOLIDAE), INFESTING THE WHITE SUCKER, *CATOSTOMUS COMMERCONI* LACÉPÈDE. *Proc. Helminthol. Soc. Wash.* 51(1):172-174. Jan. 1984. SFA 29(2)
[Div. Trop. Publ. Health, Dep. Preventive Med. Biometrics, Uniformed Serv. Univ. Health Sci., Bethedsa, MD 20814]

84-001470 Heggberget, T. G. EFFECT OF SUPERSATURATED WATER ON FISH IN THE RIVER NIDELVA, SOUTHERN NORWAY. *J. Fish Biol.* 24(1):65-74. Jan. 1984. SFA 29(2)
[Dir. Wildl. Freshwater Fish, Sverres gt. 1, N-7000 Trondheim, Norway] Fish mortalities in the River Nidelva, South Norway in 1978, were suspected to be caused by Gas Bubble Disease. In June 1980, the hydrological situation

OTHER DISEASES AND PARASITES (CONTINUED)

84-001470 CONTINUED occurring in the Nidelva in 1978 was reconstructed, and the effects were analysed by keeping fish in cages. Examination of the dead fish showed that most were killed by Gas Bubble Disease. The results also showed that brown trout, *Salmo trutta*, was the least tolerant, and eel, *Anguilla anguilla*, was the most tolerant to dissolved gas supersaturation. Only fish kept near the surface were killed while fish kept at 3m depth were mildly affected due to hydrostatic pressure compensation. In contrast to the situation in 1978, few of the wild fish were killed during the experiment in 1980.

84-001471 Hogans, W. E. HELMINTHS OF STRIPED BASS (*MORONE SAXATILIS*) FROM THE KOUCHIBOUGUAC RIVER, NEW BRUNSWICK. *J. Wildl. Dis.* 20(1):61-63. Jan. 1984. SFA 29(2)
[Aquatic Industries, Ltd., P.O. Box 294, St. Andrews, NB E0G 2X0, Canada]

84-001472 Jiwei, S. [TWO NEW SPECIES TO THE FAMILY PLEORCHIIDAE POCHE, 1926 (TREMATODE) FROM SOME MARINE FISHES IN CHINA.] *Oceanol. Limnol. Sin.* 14(4):396-401. 1983. In Chinese with English summ. SFA 29(2)
[Inst. Oceanol., Acad. Sin., China]

84-001473 Joy, J. E. PREVALENCE OF THE ANCYROCEPHALINAE (MONOGENEA) ON LARGEMOUTH AND SPOTTED BASSES IN BEECH FORK LAKE, WEST VIRGINIA. *Proc. Helminthol. Soc. Wash.* 51(1):168-170. Jan. 1984. SFA 29(2)
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701]

84-001474 Kearn, G. C. THE MIGRATION OF THE MONOGENEAN *ENTOBDELLA SOLEAE* ON THE SURFACE OF ITS HOST, *SOLEA SOLEA*. *Int. J. Parasitol.* 14(1):63-69. Feb. 1984. SFA 29(2)
[Sch. Biol. Sci., Univ. East Anglia, Norwich NR4 7TJ, U.K.]

84-001475 Kennedy, C. R. THE STATUS OF FLOUNDERS, *PLATICHTHYS FLESUS* L., AS HOSTS OF THE ACANTHOCEPHALAN *POMPHORHYNCHUS LAEVIS* (MÜLLER) AND ITS SURVIVAL IN MARINE CONDITIONS. *J. Fish Biol.* 24(2):135-149. Feb. 1984. SFA 29(2)
[Dep. Biol. Sci., Univ. Exeter, Exeter EX4 4PS, U.K.]

84-001476 Kruger, I.; J. G. Van As and J. E. Saayman. OBSERVATIONS ON THE OCCURRENCE OF THE FISH LOUSE *ARGULUS JAPONICUS* THIELE, 1900 IN THE WESTERN TRANSVAAL. *S. Afr. J. Zool.* 18(4):408-410. Nov. 1983. SFA 29(2)
[J. G. Van As: Res. Unit Fish Biol., Rand Afrikaans Univ., P.O. Box 524, Johannesburg, 2000, South Africa]

84-001477 Llewellyn, J. and M. Anderson. THE FUNCTIONAL MORPHOLOGY OF THE COPULATORY APPARATUS OF *ERGENSTREMA LABROSI* AND *LIGOPHORUS ANGUSTUS*, MONOGENEAN GILL PARASITES OF *CHELON LABROSUS*. *Parasitology* 88(1):1-7. Feb. 1984. SFA 29(2)
[Dep. Zool. Comp. Physiol., Univ. Birmingham, P.O. Box 363, Birmingham B15 2TT, England]

84-001478 Majeed, S. K.; D. W. Jolly and C. Gopinath. AN OUTBREAK OF LIVER CELL CARCINOMA IN RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, IN THE U.K. *J. Fish Dis.* 7(2):165-168. Mar. 1984. SFA 29(2)
[Huntingdon Res. Cent., Huntingdon, Cambridgeshire PE18 6ES, England]

OTHER DISEASES AND PARASITES (CONTINUED)

84-001479 Masahito, P.; T. Ishikawa and S. Takayama. SPONTANEOUS SPERMATOCYTIC SEMINOMA IN AFRICAN LUNGFISH, *PROTOPTERUS AETHIOPICUS* HECKEL. *J. Fish Dis.* 7(2):169-172. Mar. 1984. SFA 29(2)
[Dep. Exp. Pathol., Cancer Inst., Kami-Ikebukuro, Toshima-ku, Tokyo 170, Japan]

84-001480 Mauchline, J. and J. D. M. Gordon. INCIDENCE OF PARASITIC WORMS IN STOMACHS OF PELAGIC AND DEMERSAL FISH OF THE ROCKALL TROUGH, NORTHEASTERN ATLANTIC OCEAN. *J. Fish Biol.* 24(3):281-285. Mar. 1984. SFA 29(2)
[Dunstaffnage Mar. Res. Lab., P.O. Box 3, Oban, Argyll PA34 4AD, Scotland]

84-001481 McPhail, J. D. and S. D. Peacock. SOME EFFECTS OF THE CESTODE (*SCHISTOCEPHALUS SOLIDUS*) ON REPRODUCTION IN THE THREESPINE STICKLEBACK (*GASTEROSTEUS ACULEATUS*): EVOLUTIONARY ASPECTS OF A HOST-PARASITE INTERACTION. *Can. J. Zool.* 61(4):901-908. Apr. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

84-001482 Mergo, J. C., Jr. and A. M. White. A SURVEY OF MONOGENEANS ON THE GILLS OF CATOSTOMID FISHES FROM OHIO (1983). *Ohio J. Sci.* 84(1):33-35. Mar. 1984. SFA 29(2)
[Dep. Zool., Ohio State Univ., Columbus 43210]

84-001483 Muzzall, P. M. OBSERVATIONS ON TWO ACANTHOCEPHALAN SPECIES INFECTING THE CENTRAL MUDMINNOW, *UMBRA LIMI*, IN A MICHIGAN RIVER. *Proc. Helminthol. Soc. Wash.* 51(1):92-97. Jan. 1984. SFA 29(2)
[Dep. Nat. Sci., North Kedzie Lab., Mich. State Univ., East Lansing 48824]

84-001484 Poole, B. C. and T. A. Dick. METACERCARIAL DISTRIBUTION OF *APOPHALLUS BREVIS* (HETEROPHYIDAE) IN YELLOW PERCH (*PERCA FLAVESCENS*) FROM THE HEMING LAKE STUDY AREA. *Can. J. Zool.* 61(9):2104-2109. Sept. 1983. In English with French summ. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-001485 Pulsford, A. and R. A. Matthews. AN ULTRASTRUCTURAL STUDY OF THE CELLULAR RESPONSE OF THE PLAICE, *PLEURONECTES PLATESSA* L., TO *RHIPIDOCOTYLE JOHNSTONEI* NOM. NOV. (PRO-*GASTEROSTOMUM* SP. JOHNSTONE, 1905) MATTHEWS, 1968 (DIGENEA: BUCEPHALIDAE). *J. Fish Dis.* 7(1):3-14. Jan. 1984. SFA 29(2)
[Unit Fish Dis., Plymouth Polytech., Drake Circus, Plymouth, England]

84-001486 Radhakrishnan, S.; N. B. Nair and N. K. Balasubramanian. NATURE OF INFECTION OF *TRICHIURUS LEPTURUS* LINNAEUS (PISCES: TRICHIURIDAE) BY *SCOLEX PLEURONECTIS* MUELLER (CESTODA: TETRAPHYLLIDAE). *Arch. Hydrobiol.* 99(2):254-267. 1984. SFA 29(2)
[Dep. Aquatic Biol. Fish., Univ. Kerala, Beach P.O., Trivandrum 695 007, India]

84-001487 Ramadan, M. M. TREMATODES OF THE GENUS *PROCTOECES* OHHNER, 1911 (FELLODISTOMIDAE), WITH DESCRIPTION OF *PROCTOECES GOHARI* SP. N. FROM RED SEA FISHES. *Vet. Med. J.* 31(3):159-173. 1983. SFA 29(2)
[Dep. Biol., Fac. Educ., Ain Shams Univ., Cairo, Egypt]

OTHER DISEASES AND PARASITES (CONTINUED)

84-001488 Ramadan, M. M. ON *NEODICHADENA YAMAGUTTI* SP. N. (TREMATODA HEMIURIDAE) FROM THE RED SEA FISHES. *Vet. Med. J.* 31(3):143-152. 1983. SFA 29(2)
[Dep. Biol., Fac. Educ., Ain Shams Univ., Cairo, Egypt]

84-001489 Rosen, R. and T. A. Dick. EXPERIMENTAL INFECTIONS OF RAINBOW TROUT, *SALMO GAIRDNERI* RICHARDSON, WITH PLEROCERCOIDS OF *TRIAENOPHORUS CRASSUS* FOREL. *J. Wildl. Dis.* 20(1):34-38. Jan. 1984. SFA 29(2)
[Dep. Zool., Univ. Manitoba, Winnipeg, MB R3T 2N2, Canada]

84-001490 Tarter, D. C. and M. F. Sheridan. THE OCCURRENCE OF THE LEECH *MYZOBDELLA LUGUBRIS* LEIDY ON *NOTROPIS ATHERINOIDES* RAFINESQUE FROM LITTLE HURRICANE CREEK, PUTNAM COUNTY, WEST VIRGINIA. *Proc. W. Va. Acad. Sci.* 56(1):8. 1984. SFA 29(2)
[Dep. Biol. Sci., Marshall Univ., Huntington, WV 25701]

84-001491 Woodward, B. SYMPTOMS OF SEVERE RIBOFLAVIN DEFICIENCY WITHOUT OCULAR OPACITY IN RAINBOW TROUT *(SALMO GAIRDNERI). Aquaculture* 37(3):275-281. 15 Mar. 1984. SFA 29(2)
[Dep. Nutr., Coll. Biol. Sci., Univ. Guelph, Guelph, ON N1G 2W1, Canada] In the present communication the gross symptoms of severe riboflavin deficiency are reported as observed in six experiments conducted with four independent stocks of rainbow trout fry and fingerlings. Unlike other reports on salmonids, ocular opacities were infrequently observed, and neither their rate of incidence nor their severity was related to dietary riboflavin content. Compared with both satiety-fed and pair-fed controls, riboflavin-deficient trout exhibited lethargy, apparent muscular weakness, reduced appetite and growth rate, severe fin erosion (all fins), rapid opercular movements, light greenish-yellow skin coloration and high mortality rate. These symptoms, although due to riboflavin deficiency per se, are nonspecific. As the cataracts produced by others in riboflavin-deficient trout appear to be a specific, diagnostic symptom, it is important to identify those conditions which can preclude their development in riboflavin deficiency.

POLLUTION

84-001492 Bucke, D.; M. G. Norton and M. S. Rolfe. THE FIELD ASSESSMENT OF EFFECTS OF DUMPING WASTES AT SEA: 11 EPIDERMAL LESIONS AND ABNORMALITIES OF FISH IN THE OUTER THAMES ESTUARY. *Fish. Res. Tech. Rep. Minist. Agric. Fish. Food (Lowestoft)* No. 72. 16p. 1983. SFA 29(2)
[Fish Dis. Lab., Weymouth, England]

84-001493 Busch, W. N. DECLINE OF MERCURY IN YOUNG FISHES FROM WESTERN LAKE ERIE BETWEEN 1970-71 AND 1974. *Prog. Fish-Cult.* 45(5):202-206. Oct. 1983. SFA 29(2)
[U.S. FWS, Tunison Lab., 28 Gracie Rd., Cortland, NY 13045]

84-001494 Changrong, Y.; W. Wei; J. Qiongbei; W. Shuyan and Z. A. Yaoming. ON THE MERCURY POLLUTION OF THE FISH IN THE MIDDLE AND LOWER REACHES OF THE SECOND SONGHUA RIVER. *Acta Zool. Sin.* 29(4):371-382. 1983. In

POLLUTION (CONTINUED)

84-001494 CONTINUED Chinese with English summ. SFA 29(2)
[Inst. Environ. Prot., Jilin Prov., China]

84-001495 Chovelon, A.; L. George; C. Gulayets; Y. Hoyano; E. McGuinness; J. Moore; S. Ramamoorthy; S. Ramamoorthy; P. Singer; K. Smiley and A. Wheatley. PESTICIDE AND PCB LEVELS IN FISH FROM ALBERTA (CANADA). *Chemosphere* 13(1):19-32. 1984. SFA 29(2)
[Aquatic Biol. Group, Alberta Environ. Cent., Vegreville, AB TOB 4LO, Canada]

84-001496 Clark, J. R.; D. DeVault; R. J. Bowden and J. A. Weishaar. CONTAMINANT ANALYSIS OF FILLETS FROM GREAT LAKES COHO SALMON, 1980. *J. Great Lakes Res.* 10(1):38-47. 1984. SFA 29(2)
[D. DeVault: U.S. EPA, 536 South Clark St., Room 102, Chicago, IL 60605]

84-001497 Fischer, K. ACID PRECIPITATION AND THE CONCERNS FOR FISH AND WILDLIFE RESOURCES. *Proc. Conv. Int. Assoc. Fish Wildl. Agencies* 72:19-35. 1982. SFA 29(2)
[Can. Wildl. Serv., Ottawa, ON, Canada]

84-001498 Gibson, J. H.; J. N. Galloway; C. Schofield; W. McFee; R. Johnson; S. McCarley; N. Dise and D. Herzog. ROCKY MOUNTAIN ACIDIFICATION STUDY. *U.S. Fish Wildl. Serv. FWS/OBS*-80/40.17. xiii + 137p. Oct. 1983. SFA 29(2)
[Nat. Resour. Ecol. Lab., Colo. State Univ., Fort Collins 80523]

84-001499 Gunn, J. M. and W. Keller. *IN SITU* MANIPULATION OF WATER CHEMISTRY USING CRUSHED LIMESTONE AND OBSERVED EFFECTS ON FISH. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):19-24. Jan.-Feb. 1984. SFA 29(2)

84-001500 Houghton, J. P. and L. A. Peterson. FISHERIES AND WATER QUALITY CONDITIONS IN THE WULIK RIVER SYSTEM OF THE DE LONG MOUNTAINS, ALASKA: IMPLICATIONS OF PROPOSED HARD ROCK MINE DEVELOPMENT. *Proc. Alaska Sci. Conf.* 33:162. Sept. 1982. Abstract only. SFA 29(2)
[Dames & Moore, 800 Cordova St., Suite 101, Anchorage, AK 99501]

84-001501 International Council for the Exploration of the Sea. REPORT OF THE ICES ADVISORY COMMITTEE ON MARINE POLLUTION, 1983. *Int. Counc. Explor. Sea Coop. Res. Rep.* 124. 67p. Sept. 1983. SFA 29(2)
[Int. Counc. Explor. Sea, Palaegade 2-4, 1261 Copenhagen K, Denmark]

84-001502 Jones, P. G. W.; C. W. Baker and J. Ólafsson. REPORTS ON THE ICES FIRST, SECOND AND THIRD ROUND INTERCALIBRATIONS FOR TRACE METALS IN SEA-WATER. *Int. Counc. Explor. Sea Coop. Res. Rep.* 125. 33p. Nov. 1983. SFA 29(2)
[Int. Counc. Explor. Sea, Palaegade 2-4, 1261 Copenhagen K, Denmark]

POLLUTION (CONTINUED)

84-001503 Kretser, W. A. and J. R. Colquhoun. TREATMENT OF NEW YORK'S ADIRONDACK LAKES BY LIMING. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):36-41. Jan.-Feb. 1984. SFA 29(2)

84-001504 Light, R. W. GROWTH AND REPRODUCTIVE ECOLOGY OF THE EASTERN BROOK TROUT, *SALVELINUS FONTINALIS*, IN STREAMS OF DIFFERING VULNERABILITY TO ACIDIC ATMOSPHERIC DEPOSITION. *Ph.D. dissertation, Pa. State Univ.* 222p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(8):2325. Feb. 1984. SFA 29(2)

84-001505 Myers, P. C. SOIL EROSION AND ITS EFFECTS ON FISH AND WILDLIFE RESOURCES. *Proc. Conv. Int. Assoc. Fish Wildl. Agencies* 72:36-39. 1982. SFA 29(2)
[U.S. Dep. Agric., Soil Conserv. Serv., Washington, DC]

84-001506 Olson, K. S. and J. Reynolds. AN ASSESSMENT OF HEAVY METAL CONCENTRATIONS IN MULLET (*MUGIL CEPHALUS*) FROM THE TAMPA BAY AREA. *Fla. Sci.* 47(Suppl. 1):18. Mar. 1984. Abstract only. SFA 29(2)
[Dep. Biol., Eckerd Coll., St. Petersburg, FL 33733] Adult specimens of *Mugil cephalus* were obtained from several inshore areas around Tampa Bay. Samples of liver, kidney, and muscle tissue were digested in acid and analyzed for copper, lead, mercury, and cadmium using a Varian AA-1475 flame atomic absorption spectrophotometer. High levels of construction work, boat traffic, and other human activity in the Tampa Bay area may result in elevated concentrations of heavy metals and other pollutants in local marine organisms. Heavy metals tend to accumulate in liver and kidney tissues of teleosts; analysis of these tissues provides data on current pollution levels in the bay and forms a basis for comparison to other geographic areas or to the same area at a later date.

84-001507 Ray, S.; B. M. Jessop; J. Coffin and D. A. Swetnam. MERCURY AND POLYCHLORINATED BIPHENYLS IN STRIPED BASS (*MORONE SAXATILIS*) FROM TWO NOVA SCOTIA RIVERS. *Water Air Soil Pollut.* 21(1-4):15-23. Jan. 1984. SFA 29(2)
[Dep. Fish. Oceans, P.O. Box 550, Halifax, NS, Canada]

84-001508 Reed, J. P.; J. M. Miller; D. F. Pence and B. Schaich. THE EFFECTS OF LOW LEVEL TURBIDITY ON FISH AND THEIR HABITAT. *Univ. N. C. Water Resour. Res. Inst. Rep.* No. 190. x + 40p. Aug. 1983. SFA 29(2)
[Dep. Zool., N. C. State Univ., Raleigh 27650]

84-001509 Rosseland, B. O. and O. K. Skogheim. ATTEMPTS TO REDUCE EFFECTS OF ACIDIFICATION ON FISHES IN NORWAY BY DIFFERENT MITIGATION TECHNIQUES. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):10-16. Jan.-Feb. 1984. SFA 29(2)

84-001510 Schindler, D. W. RESPONSE OF LAKE ECOSYSTEMS TO ACID PRECIPITATION. *Bull. Ecol. Soc. Am.* 64(2):168. June 1983. Abstract only. SFA 29(2)
[Freshwater Inst., Winnipeg, MB, Canada] In contrast to common belief, production, decomposition and nutrient cycling are relatively resistant to acidification, suggesting that "metabolic" measurements are poor indicators

POLLUTION (CONTINUED)

84-001510 CONTINUED of ecological stress due to acidification. Changes in species composition are far more sensitive, and disruption of normal food-chain relations is probably far more damaging to the ecosystem than loss of productivity or nutrient cycling. The earliest biological changes occur at pH values slightly below 6. A number of species of benthic Crustacea and Mollusca and some cyprinid fishes disappear suddely at pH values of 5.8 to 6.0, either due to direct toxicity or to reproductive stress. Some of these organisms are important in the diets of sport fishes, putting an initial stress on these fishes via the food chain. Detrimental changes in the population of some species in whole-lake experiments was due to enhancement of natural stresses by acidifidation, including predation, parasitism and physiological functions. There is no way that such changes can be predicted from laboratory bioassays, so that reliance solely on the latter will lead to consistent underestimates of ecosystem damage due to acidification.

84-001511 Schreiber, R. K. and P. J. Rago. THE FEDERAL PLAN FOR MITIGATION OF ACID PRECIPITATION EFFECTS IN THE UNITED STATES: OPPORTUNITIES FOR BASIC AND APPLIED RESEARCH. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):31-36. Jan.-Feb. 1984. SFA 29(2)

84-001512 Sorensen, E. M. B.; P. M. Cumbie; T. L. Bauer; J. S. Bell and C. W. Harlan. HISTOPATHOLOGICAL, HEMATOLOGICAL, CONDITION-FACTOR, AND ORGAN WEIGHT CHANGES ASSOCIATED WITH SELENIUM ACCUMULATION IN FISH FROM BELEWS LAKE, NORTH CAROLINA. *Arch. Environ. Contam. Toxicol.* 13(2):153-162. Mar. 1984. SFA 29(2)
[Dep. Pharmacol./Toxicol., Univ. Tex., Austin 78712]

84-001513 Thomann, R. V. and J. P. Connolly. MODEL OF PCB IN THE LAKE MICHIGAN LAKE TROUT FOOD CHAIN. *Environ. Sci. Technol.* 18(2):65-71. Feb. 1984. SFA 29(2)
[Environ. Eng. Sci., Manhattan Coll., Bronx, NY 10471]

84-001514 Ueda, T. and M. Takeda. [MERCURY AND SELENIUM LEVEL IN TWO SPECIES OF SHARKS.] *Bull. Jpn. Soc. Sci. Fish.* 49(11):1731-1735. Nov. 1983. In Japanese wtih English summ. SFA 29(2)
[Dep. Food Sci. Technol., Shimonoseki Univ. Fish., Shimonoseki 759-65, Japan]

84-001515 Wiener, J. G. COMPARATIVE ANALYSES OF FISH POPULATIONS IN NATURALLY ACIDIC AND CIRCUMNEUTRAL LAKES IN NORTHERN WISCONSIN. *U.S. Fish Wildl. Serv. FWS/OBS*-80/40.16. xiv + 107p. Sept. 1983. SFA 29(2)
[U.S. FWS, Columbia Natl. Fish. Res. Lab., Field Res. Stn., P.O. Box 936, La Crosse, WI 54601]

84-001516 Yulin, W.; Z. Hongru; H. Lanying and L. Qingxiang. [ACCUMULATION, TISSUE DISTRIBUTION AND DEPURATION OF Cd, Pb, Cu, Ni BY *TILAPIA MOSSAMBICA*.] *Oceanol. Limnol. Sin.* 14(5):473-481. 1983. In Chinese with English summ. SFA 29(2)
[Inst. Oceanol., Acad. Sin., China]

POLLUTION (CONTINUED)

84-001517 Zurbuch, P. E. NEUTRALIZATION OF ACIDIFIED STREAMS IN WEST VIRGINIA. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):42-47. Jan.-Feb. 1984. SFA 29(2)
[W. Va. Dep. Nat. Resour., Operations Center, Elkins]

TOXICOLOGY; BIOASSAYS

84-001518 Bourne, P. K. THE USE OF MS 222 (TRICAINE METHANESULPHONATE) AS AN ANAESTHETIC FOR ROUTINE BLOOD SAMPLING IN THREE SPECIES OF MARINE TELEOSTS. *Aquaculture* 36(4):313-321. 1 Feb. 1984. SFA 29(2)
[Mar. Biol. Stn., Port Erin, Isle of Man, U.K.] The effects of the anaesthetic MS 222 on certain blood parameters in three species of marine flatfish were studied. Hyperglycaemia was observed in turbot (*S. maximus*), with glucose levels significantly increased from 29.29 ± 1.24 to 49.37 ± 2.01 mg/100 ml at 10°C and from 29.15 ± 1.06 to 52.60 ± 3.97 mg/100 ml at 15°C. Plasma magnesium was elevated in both plaice, *P. platessa* (1.91 ± 0.09 to 3.41 ± 0.59 mmol/l) and dabs, *L. limanda* (1.39 ± 0.07 to 7.89 ± 1.66 mmol/l) held at 10°C. Plasma chloride was markedly increased in dabs (150.09 ± 1.12 to 166.92 ± 2.08 mmol/l) but decreased in both turbot groups, from 168.37 ± 4.78 to 146.88 ± 2.86 mmol/l at 10°C and 155.77 ± 3.67 to 140.67 ± 1.57 at 15°C. The implications for the use of MS 222 as an anaesthetic for these marine species are discussed.

84-001519 Boyle, T. P.; S. Finger; R. Paulson and C. Rabeni. THE EFFECT OF FLUORENE ON SHALLOW LENTIC ECOSYSTEMS: A COMPARISON OF FIELD AND LABORATORY RESULTS. *Bull. Ecol. Soc. Am.* 64(2):70. June 1983. Abstract only. SFA 29(2)
[U.S. FWS, Columbia, MO] The results of laboratory toxicity assessments were compared with the effects of the polynuclear aromatic hydrocarbon, fluorene, in pond ecosystems. Fourteen ponds stocked with similar densities of bass and bluegill were dosed with fluorene to nominal concentrations of 0, 0.12, 0.5, 2.0 and 10.0 mg/L. Bass were eliminated from ponds with concentrations of 2.0 mg/L and greater. Fish yield was reduced at concentrations of 0.12 mg/L and above which was similar to the 30-day exposure and growth response of bluegill in the laboratory. The number of total individuals, number of species, and species diversity of emergent insects was not directly related to the levels of fluorene treatment. However, laboratory tests indicated that 0.6 mg/L reduced *Chironomus* emergence by 50%. The zooplankton community decreased drastically after treatments of 5.0 and 10.0 mg/L. Rotifers recivered within 2-3 weeks, while crustaceans took 5-7 weeks to attain former densities. *Daphnia magna* was the most sensitive organism in the laboratory tests, while bass was more sensitive in the ponds.

84-001520 Bresch, H. A SIMPLE WAY OF STORING NUMERICAL AND METRICAL PARAMETERS OF FISH PROGENY FOR TOXICOLOGICAL STUDIES BY PHOTOGRAMS. *Bull. Environ. Contam. Toxicol.* 32(4):491-496. Apr. 1984. SFA 29(2)
[Bundesforsch. Ernährung, Engesserstr. 20, D-7500 Karlsruhe 1, West Germany]

84-001521 Chung, K. S. LETHAL EFFECTS OF CADMIUM IN TROPICAL FISHES. *Bull. Jpn. Soc. Sci. Fish.* 49(10):1565-1568. Oct. 1983. SFA 29(2)
[Inst. Oceanogr., Univ. Oriente, Cumaná, Venezuela]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001522 Couch, J. A. HISTOPATHOLOGY AND ENLARGEMENT OF THE PITUITARY OF A TELEOST EXPOSED TO THE HERBICIDE TRIFLURALIN. *J. Fish Dis.* 7(2):157-163. Mar. 1984. SFA 29(2)
[U.S. EPA, Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561] Pituitaries of sheepshead minnows, *Cyprinodon variegatus*, exposed for 19 months to 1-5 µg/l trifluralin in the laboratory exhibited enlargement, pseudocysts, congestion of blood vessels and oedema. Most of the fish with an enlarged pituitary also had induced diffuse and/or focal vertebral hyperostosis and other dysplastic vertebral changes. Several speculative mechanistic paths are suggested for the mode of effect of trifluralin on the vertebral and pituitary tissues. Abnormal enlargement or variation in sizes of pituitaries from fish of the same age, along with histopathological findings may be related to the environmental quality of the fish's habitat, and provide indications of stress within individuals resulting from toxicant exposure.

84-001523 Coughlan, D. J. SIMPLE DEVICE TO REDUCE CONTAMINATION IN AQUATIC TOXICOLOGY STUDIES. *Prog. Fish-Cult.* 45(4):207-208. Oct. 1983. SFA 29(2)
[N.Y. Coop. Fish. Res. Unit, Dep. Nat. Resour., Cornell Univ., Ithaca 14853]

84-001524 Daoust, P.Y.; G. Wobeser and J. D. Newstead. ACUTE PATHOLOGICAL EFFECTS OF INORGANIC MERCURY AND COPPER IN GILLS OF RAINBOW TROUT. *Vet. Pathol.* 21(1):93-101. Jan. 1984. SFA 29(2)
[Dep. Vet. Pathol., Univ. Saskatchewan, Saskatoon, SK, Canada]

84-001525 Ferreira, J. T.; H. J. Schoonbee and G. L. Smit. THE ANAESTHETIC POTENCY OF BENZOCAINE-HYDROCHLORIDE IN THREE FRESHWATER FISH SPECIES. *S. Afr. J. Zool.* 19(1):46-50. Jan. 1984. In English with Afrikaans summ. SFA 29(2)
[Res. Unit Fish Biol., Rand Afrikaans Univ., P.O. Box 524, Johannesburg, 2000 South Africa] Anaesthesia was induced in the common carp, *Cyprinus carpio*, tilapia, *Oreochromis mossambicus* and rainbow trout, *Salmo gairdneri*, at concentrations of 25; 50; 75 and 100 mg/l of benzocaine-hydrochloride as well as neutralized benzocaine-hydrochloride at water temperatures of 15; 20 and 25°C. The results obtained indicated intra-and interspecific differences in the susceptibility of fish to anaesthesia due to metabolic, chemoreceptive and temperature tolerance differences in and amongst the thre species.

84-001526 Fraser, J. A. L. and E. R. Clark. THE EFFECTS OF A SETTLED INDUSTRIAL-DOMESTIC SEWAGE WORKS EFFLUENT FROM PERCOLATING FILTERS ON THE SURVIVAL AND GROWTH OF VARIOUS STAGES OF RAINBOW TROUT, *SALMO GAIRDNERI* (RICHARDSON). *J. Fish Biol.* 24(1):13-27. Jan. 1984. SFA 29(2)
[Techno-Commercial Dep., Inteox Chemicals Ltd., Baronet Rd., Warrington, Cheshire WA4 6HB, U.K.] Comparisons were made of the mortality, growth and condition factor over a 50-day period of eleutheroembryos, alevins, 2-month fry, 4-month fry and 1+ rainbow trout, *Salmo gairdneri*, in water of three qualities--Birmingham tap-water, 50% and 100% settled effluent from percolating filters (Minworth Effluent Treatment Works) when dissolved oxygen levels were maintained near 100% ASV. There was no significant mortality among life stages in control tap-water but the LT50 values of life stages in both 50% effluent and 100% effluent reavealed significant differences. Inter-treatment comparisons showed similiar mortalities of eleutheroembryos, of 2-month fry and of 1+fish in the three treatments but LT50 values of 4-month fry showed significant differences. Growth rates of 2-month and 4-month fry were suppressed in both effluents after 7 days and there was a significant deterioration in the *K* factor of these life

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001526 CONTINUED stages after 14 days. Predicted toxicities (the sum of the proportions of the 48-h LC50 of the individual poisons to rainbow trout) were compared with the observed toxicity in 50% and 100% effluent. The relevance of *in vivo* testing in comparison to predictive techniques is compared.

84-001527 Gaino, E.; A. Arillo and P. Mensi. INVOLVEMENT OF THE GILL CHLORIDE CELLS OF TROUT UNDER ACUTE NITRITE INTOXICATION. *Comp. Biochem. Physiol. A Comp. Physiol.* 77(4):611-617. 1984. SFA 29(2)
[Inst. Zool., Univ. Genova, Via Balbi 5, Genova 16126, Italy]

84-001528 Gilmore, J. Y. III; H. M. Pratt and E. G. Ellgaard. ACID ENVIRONMENTS: EFFECTS ON THE BLUEGILL SUNFISH, *LEPOMIS MACROCHIRUS*. *Proc. La. Acad. Sci.* 46:137. 1983. Abstract only. SFA 29(2)
Bluegill sunfish, *Lepomis macrochirus*, were exposed to varying concentrations of either HCl, H_3PO_4, HNO_3, or H_2SO_4. The 96 h LC 50 for these acids varied somewhat, but was approximately pH 4.0. A difference in acid tolerance was observed in fish in constant pH compared to fish in fluctuating environments in which the pH was permitted to become less acidic, after each addition of acid. The acids at sublethal concentrations had an effect on the swimming behavior of the bluegill. The results serve to emphasize the impact of acid precipitation on aquatic environments.

84-001529 Gunkel, G. UNTERSUCHUNGEN ZUR ÖKOTOXIKOLOGISCHEN WIRKUNG EINES HERBIZIDS IN EINEM AQUATISCHEN MODELLÖKOSYSTEM. II. NAHRUNGSKETTENPROBLEME UND SCHADSTOFFBILANZIERUNG. [INVESTIGATIONS OF THE ECOTOXICOLOGICAL EFFECT OF A HERBICIDE IN AN AQUATIC MODEL ECOSYSTEM. II. FOOD CHAIN SIGNIFICANCE AND PESTICIDE BALANCE.] *Arch. Hybrobiol. Supplementb.* 69(1):130-168. 1984. In German with English summ. SFA 29(2)
[Tech. Univ. Berlin, Inst. Tech. Umweltschutz, Sekr. KF 8, Str. 17. Juni 135, D-1000 Berlin 12, West Germany]

84-001530 Hall, L. H. and L. B. Kier. MOLECULAR CONNECTIVITY OF PHENOLS AND THEIR TOXICITY TO FISH. *Bull. Environ. Contam. Toxicol.* 32(3):354-362. Mar. 1984. SFA 29(2)
[Dep. Chem., East Nazarene Coll., Quincy, MA 02170]

84-001531 Heath, A. G. CHANGES IN TISSUE ADENYLATES AND WATER CONTENT OF BLUEGILL, *LEPOMIS MACROCHIRUS*, EXPOSED TO COPPER. *J. Fish Biol.* 24(3):299-309. Mar. 1984. SFA 29(2)
[Dep. Biol., VPI&SU, Blacksburg, VA 24061] Bluegill were exposed to copper (2.0 mg/l^{-1} unfiltered) for 24, 48, 72 or 96 h at 24°C. This concentration approximated the 96h LC20. Water content of liver increased 4.8% after 24 h exposure and muscle 4.6% by 48 h. These changes persisted throughout the 96 h experiments. Copper exposed fish exhibited decreases in muscle ATP, ADP, total adenylates, and energy charge by 48 h. There was a trend toward recovery of ATP with further exposure. Liver ATP of exposed fish was lower than controls at all intervals with the greatest difference evident at 48 h. No significant changes in brain adenylates were observed. Muscle and liver lactic acid was unchanged at 48 h exposure, therefore tissue hypoxia was not the cause of the adenylate changes. It was concluded that copper caused decreases in muscle and liver ATP several days before probable death of copper exposed fish and the changes seen are the result of dilution by increased tissue water, and the copper acting on certain cellular enzymes involved in detoxification and energy metabolism.

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001532 Johnson, R. D. THE USE OF QUANTITATIVE HISTOPATHOLOGY IN AQUATIC TOXICOLOGY: CORRELATIONS BETWEEN GILL STRUCTURE AND ROUTINE TOXICITY MEASURES IN RAINBOW TROUT. *Ph.D. dissertation, Univ. Wyo.* 101p. 1983. From Diss. Abstr. Int. B Sci. Eng. 44(9):2678. Mar. 1984. SFA 29(2)

84-001533 Kain, D. G. and J. E. Schmidt. TOXICITY TO FATHEAD MINNOWS (*PIMEPHALES PROMELAS*) OF OIL AND GAS WELL DRILLING WASTEWATER FOLLOWING FIELD TREATMENT. *Proc. W. Va. Acad. Sci.* 56(1):6. 1984. Abstract only. SFA 29(2)

[Biol. Sect., Div. Water Resour., W. Va. Dep. Nat. Resour., Charleston 25311] Wastewater generated during the drilling phase of oil and gas produciton in West Virginia is typically acidic, with high concentrations of chlorides and metals. On-site treatment for metals and suspended solid removal and subsequent local disposal, via land application and/or metered stream discharge, has been proposed. Concerns over potential impacts to acquatic communities have led to intensive biological monitoring during experimental discharges. Laboratory (static) and instream acute toxicity tests with fathead minnows (*P. promelas*) have been conducted on selected sites. Of 16 twenty-four-hour static tests, 7 showed no measurable toxicity, 3 were considered mildly toxic (LC50 > 75%), 2 moderately toxic (LC50 of 30-74%), and 4 highly toxic (LC50 < 30%). The lowest LC50 calculated was 10.8%. Toxicity was not clearly shown in any of the 5 instream (during discharge) tests. Discharge at each site was a one-time event and generally lasted 24-48 hours. Dishcarge rates were based on a maximum wastewater/streamwater ratio of 1/300. Based on the short durations and high dilution rates of the discharges, impacts on aquatic communities were felt to be negligible.

84-001534 Katti, S. R. and A. G. Sathyanesan. CHANGES IN TISSUE LIPID AND CHOLESTEROL CONTENT IN THE CATFISH *CLARIAS BATRACHUS* (L.) EXPOSED TO CADMIUM CHLORIDE. *Bull. Environ. Contam. Toxicol.* 32(4):486-490. Apr. 1984. SFA 29(2)

[Dep. Zool., Banaras Hindu Univ., Varanasi-221005, India]

84-001535 Kojima, H. and T. Yoshida. METABOLITES OF DIISOPROPYLNAPHTHALENE IN CARP. PART 2. *IN VITRO* EXPERIMENT. *Chemosphere* 13(2):261-268. 1984. SFA 29(2)

[Dep. Mar. Environ. Sci. Technol., Tokyo Univ. Fish., 5-7, Konan 4-chome, Minato-ku, Tokyo 108, Japan]

84-001536 Lal, H.; V. Misra; P. N. Viswanathan and C. R. Krishna Murti. EFFECT OF SYNTHETIC DETERGENTS ON SOME OF THE BEHAVIORAL PATTERNS OF FISH FINGERLINGS (*CIRRHINA MRIGALA*) AND ITS RELATION TO ECOTOXICOLOGY. *Bull. Environ. Contam. Toxicol.* 32(1):109-115. Jan. 1984. SFA 29(2)

[V. Misra: Ind. Toxicol. Res. Cent., P.O. Box 80, M.G. Marg, Lucknow-226 001, India]

84-001537 LeBlanc, G. A. INTERSPECIES RELATIONSHIPS IN ACUTE TOXICITY OF CHEMICALS TO AQUATIC ORGANISMS. *Environ. Toxicol. Chem.* 3(1):47-60. 1984. SFA 29(2)

[Dep. Biol., Univ. South Fla., Tampa 33620] The acute sensitivities of several species of aquatic organisms to chemicals categorized as nonpesticide organics, pesticides and metals were correlated using polynomial regression analyses. All species analyzed--fresh- and saltwater fish, invertebrates and algae--responded similarly to the toxicity of nonpesticide organics. Different groups of organisms responded differently to the pesticides.

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84-001537 CONTINUED Different species of fish of the same family responded almost identically to the toxicity of pesticides, whereas fishes of different families responded similarly, but to a lesser degree. No relationship existed between the acute sensitivities of a fish and an invertebrate. A significant correlation was determined in acute sensitivities to metals between bluegill and fathead minnows, and between bluegill and *Daphnia magna*. The mode of toxicity of metals seems to be the same among species, although the degree of toxicity may differ.

84-001538 LeBlanc, G. A.; J. D. Mastone; A. P. Paradice; B. F. Wilson; H. B. Lockhart, Jr. and K. A. Robillard. THE INFLUENCE OF SPECIATION ON THE TOXICITY OF SILVER TO FATHEAD MINNOW *(PIMEPHALES PROMELAS). Environ. Toxicol. Chem.* 3(1):37-46. 1984. SFA 29(2)

[K.A. Robillard: Health Safety Human Factors Lab., Eastman Kodak Co., Rochester, NY 14650] Silver sulfide, silver thiosulfate complex and silver chloride complexes were tested and compared with free silver ion for their toxic effects in 96-h flow-through acute toxicity tests using fathead minnows (*Pimephales promelas*). Thirty-day fathead minnow embryo-larval tests were conducted with silver sulfide and silver thiosulfate complex. Extensive chemical analyses were performed to quantify actual exposures. Compared with free silver ion, silver chloride complexes were about 300 times less toxic acutely, silver sulfide was at least 15,000 times less toxic acutely and silver thiosulfate complex was more than 17,500 times less toxic acutely. The estimated maximum acceptable toxicant concentrations (MATCs) determined for the embryo-larval tests with silver sulfide and silver thiosulfate complex were greater than 11 mg/L (as total silver) and greater than 16 but less than 35 mg/L (as total silver), respectively. The MATC previously reported for free silver ion from tests with rainbow trout (*Salmo gairdneri*) was greater than 0.00009 but less than 0.00017 mg/L. These differences in acute toxicities and the differences of five orders of magnitude in the MATC values are attributed to the influence of chemical speciation on the effects of silver in the aquatic environment. Thus, the speciation of silver is an essential factor in its potential to affect fish and, presumably, other aquatic life, and therefore should be considered in environmental risk assessment.

84-001539 Lui, O. S.; M. A. Ambak and A. K. M. Mohsin. A COMPARISON OF TOLERANCE LEVEL OF TILAPIA TO MALATHION ON CLEAR AND MUDDY BOTTOM. *Malay. Appl. Biol.* 12(2):25-29. Dec. 1983. SFA 29(2)

[322, Poh Kwong Park, Kuching, Malaysia]

84-001540 McDonald, D. G. THE EFFECTS OF H^+ UPON THE GILLS OF FRESHWATER FISH. *Can. J. Zool.* 61(4):691-703. Apr. 1983. In English with French summ. SFA 29(2)

[Dep. Biol., McMaster Univ., Hamilton, ON L8S 4K1, Canada]

84-001541 Mikhaylova, L. V. COMPLEX FORMATION BETWEEN THE WATER-SOLUBLE PETROLEUM FRACTION AND BLOOD AND LIVER PROTEINS OF CARP, *CYPRINUS CARPIO* (CYPRINIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):154-158. 1983. SFA 29(2)

[Siberian Fish. Res. Proj. Eng. Inst. Tyumen, USSR]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001542 Millemann, R. E.; W. J. Birge; J. A. Black; R. M. Cushman; K. L. Daniels; P. J. Franco; J. M. Giddings; J. F. McCarthy and A. J. Stewart. COMPARATIVE ACUTE TOXICITY TO AQUATIC ORGANISMS OF COMPONENTS OF COAL-DERIVED SYNTHETIC FUELS. *Trans. Am. Fish. Soc.* 113(1):74-85. Jan. 1984. SFA 29(2)
[Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37831]

84-001543 Nichols, J. W.; G. A. Wedemeyer; F. L. Mayer; W. W. Dickhoff; S. V. Gregory; W. T. Yasutake and S. D. Smith. EFFECTS OF FRESHWATER EXPOSURE TO ARSENIC TRIOXIDE ON THE PARR-SMOLT TRANSFORMATION OF COHO SALMON *(ONCORHYNCHUS KISUTCH). Environ. Toxicol. Chem.* 3(1):143-149. 1984. SFA 29(2)
[G.A. Wedemeyer: U.S. FWS, Bldg. 204, Naval Stn., Seattle, WA 98115] The effects of chronic (6 months) exposure to arsenic trioxide in fresh water on the parr-smolt transformation of coho salmon (*Oncorhynchus kisutch*) were evaluated. Exposure to 300 µg As/L (as As_2O_3) appeared to delay the onset of the normal increase in plasma thyroxine concentration and cause a transient reduction of gill Na^+,K^+-ATPase activity. Fish exposed to 300 µg As/L also migrated to the sea less successfully than did nonexposed smolts, but there were no effects on the survival and growth of smolts held in 28 ppt salt water for 6 months.

84-001544 Palachek, R. M. and J. R. Tomasso. NITRITE TOXICITY TO FATHEAD MINNOWS: EFFECT OF FISH WEIGHT. *Bull. Environ. Contam. Toxicol.* 32(2):238-242. Feb. 1984. SFA 29(2)
[Aquatic Stn., Southwest Tex. State Univ., San Marcos 78666]

84-001545 Pennec, J. P. and M. Aubin. EFFECTS OF ACONITINE AND VERATRINE ON THE ISOLATED PERFUSED HEART OF THE COMMON EEL (*ANGUILLA ANGUILLA* L.). *Comp. Biochem. Physiol. C Comp. Pharmacol. Toxicol.* 77(2):367-369. 1984. SFA 29(2)
[Lab. Physiol. Anim., ERA CNRS 622, Fac. Sci. Tech., Ave. V. Le Gorgeu, 29283 Brest Cédex, France]

84-001546 Pimentel, R. and R. V. Bulkley. INFLUENCE OF WATER HARDNESS ON FLUORIDE TOXICITY TO RAINBOW TROUT. *Environ. Toxicol. Chem.* 2(4):381-386. 1983. SFA 29(2)
[Utah Coop. Fish. Res. Unit, Utah State Univ., Logan 84322] Static bioassays were conducted to determine effects of water hardness on toxicity of sodium fluoride to rainbow trout (*Salmo gairdneri*). Ninety-six hour LC_{50} values increased from 51 to 193 mg/L [F] as water hardness levels rose from 17 to 385 mg/L $CaCO_3$. Tests of chronic toxicity at different water hardness levels are needed before fluoride standards for aquatic life, such as fish, can be set.

84-001547 Poe, W. E. and R. P. Wilson. ABSORPTION OF MALACHITE GREEN BY CHANNEL CATFISH. *Prog. Fish-Cult.* 45(4):228-229. Oct. 1983. SFA 29(2)
[Dep. Biochem., Miss. State. Univ., Mississippi State 39762]

84-001548 Ramusino, M. C.; P. Dellavedova and D. Zanzottera. EFFECTS OF CRUDE DUBAI OIL ON *SALMO GAIRDNERI* RICH. AND *CARASSIUS AURATUS* L. *Bull. Environ. Contam. Toxicol.* 32(3):368-376. Mar. 1984. SFA 29(2)
[Dep. Biol., Sez. Ecol. Via Celoria, 26, 20133 Milano, Italy]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001549 Rao, K. R. S. S.; K. S. P. Rao; I. K. A. Sahib and K. V. R. Rao. COMPARATIVE EVALUATION OF TOXICITY OF ELSAN IN CONTINUOUS FLOW AND STATIC SYSTEMS WITH REFERENCE TO OXYGEN CONSUMPTION AND EXCRETION IN *OPHIOCEPHALUS PUNCTATUS* (BLOCH). *Indian J. Fish.* 28(1-2):254-258. 1981. SFA 29(2)
[Dep. Zool., S.V. Univ. Post Grad. Ext. Cent., Kavali, A.P., India]

84-001550 Rath, S. and B. N. Misra. CHANGES IN NUCLEIC ACIDS AND PROTEIN CONTENT OF *TILAPIA MOSSAMBICA* EXPOSED TO DICHLORVOS (DDVP). *Indian J. Fish.* 27(1-2):76-81. 1980. SFA 29(2)
[Lab. Environ. Toxicol., Dep. Bot., Berhampur Univ., Berhampur, Orissa, India]

84-001551 Rice, S. D. SURVIVAL AND METABOLISM OF AROMATIC HYDROCARBONS IN SALMONIDS AFTER PRE-TREATMENT EXPOSURES TO HYDROCARBONS. *Alaska Sci. Conf.* 34:124. 1983. Abstract only. SFA 29(2)
[Auke Bay Lab., NMFS, P.O. Box 155, Auke Bay, AK 99821]

84-001552 Roch, M. and J. A. McCarter. METALLOTHIONEIN INDUCTION, GROWTH, AND SURVIVAL OF CHINOOK SALMON EXPOSED TO ZINC, COPPER, AND CADMIUM. *Bull. Environ. Contam. Toxicol.* 32(4):478-485. Apr. 1984. SFA 29(2)
[Dep. Biochem. Microbiol., Univ. Victoria, Victoria, BC V8W 2Y2, Canada]

84-001553 Rombough, P. J. and E. T. Garside. THE INFLUENCE OF THE ZONA RADIATA ON THE TOXICITY AND UPTAKE OF CADMIUM IN EMBRYOS OF ATLANTIC SALMON (*SALMO SALAR*). *Can. J. Zool.* 61(10):2338-2343. Oct. 1983. In English with French summ. SFA 29(2)
[Dep. Fish. Oceans, Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-001554 Russell, L. C. and M. Fingerman. EXPOSURE TO THE WATER SOLUBLE FRACTION OF CRUDE OIL OR TO NAPHTHALENES ALTERS BREATHING RATES IN GULF KILLIFISH, *FUNDULUS GRANDIS*. *Bull. Environ. Contam. Toxicol.* 32(3):363-367. Mar. 1984. SFA 29(2)
[Dep. Biol., Tulane Univ., New Orleans, LA 70118]

84-001555 Saltes, J. G. and G. C. Bailey. USE OF FISH GILL AND LIVER TISSUE TO MONITOR ZINC POLLUTION. *Bull. Environ. Contam. Toxicol.* 32(2):233-237. Feb. 1984. SFA 29(2)
[Dep. Civil Environ. Eng., Wash. State Univ., Pullman 99164]

84-001556 Shimada, Y. and N. Egami. THE UNIQUE RESPONSES OF THE PRIMORDIAL GERM CELLS IN THE FISH *ORYZIAS LATIPES* TO GAMMA-RAYS. *Int. J. Radiation Biol.* 45(3):227-235. Mar. 1984. SFA 29(2)
[Zool. Inst., Fac. Sci., Univ. Tokyo, Hongo, Tokyo 113, Japan]

84-001557 Siva Prasada Rao, K.; I. Kabeer Ahamad and K. V. Ramana Rao. IMPACT OF METHYL PARATHION ON LACTATE DEHYDROGENASE ISOZYMES OF A TELEOST *TIPALIA MOSSAMBICA* (PETERS). *Indian J. Fish.* 29(1-2):185-190. 1982. SFA 29(2)
[Pestic. Toxicol. Div., Dep. Zool., S. V. Univ. Post Grad. Ext. Serv., Kavali, A. P., India]

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001558 Siva Prasada Rao, K.; K. R. S. Sambasiva Rao; K. Sreenivasa Babu and K. V. Ramana Rao. TOXIC IMPACT OF PHENTHOATE ON SOME FUNCTIONAL ASPECTS OF NITROGEN METABOLISM IN TISSUES OF THE FISH *CHANNA PUNCTATUS*. *Indian J. Fish.* 29(1-2):229-233. 1982. SFA 29(2)
[Dep. Zool., S. V. Univ., P. G. Cent., Kavali, A. P., India]

84-001559 Sorensen, E. M. B. and T. L. Bauer. PLANIMETRIC ANALYSIS OF REDEAR SUNFISH (*LEPOMIS MICROLOPHUS*) HEPATOPANCREAS FOLLOWING SELENIUM EXPOSURE. *Environ. Toxicol. Chem.* 3(1):159-165. 1984. SFA 29(2)
[Dep. Pharmacol. Toxicol., Univ. Tex., Austin 78712] Areal ratios of pancreas cells to liver cells (P/L ratios) were determined planimetrically and compared with selenium accumulated in the hepatopancreas (liver and associated exocrine pancreas) of redear sunfish (*Lepomis microlophus*). Fish were collected from four locations in Martin Lake, Texas, and from a reference lake 8 km upstream in the same drainage system. Fish collected from selenium-contaminated areas in Martin Lake had significantly higher P/L ratios than did reference fish. The increase in the P/L ratios could be explained by either pancreatic cell hyperplasia or parenchymal hepatocyte necrosis and cell loss. Since a previous publication documented both central necrosis with loss of parenchymal hepatocytes and architectural disorganization and endoplasmic reticulum changes in the exocrine pancrease cells of these same redear sunfish, both changes probably occurred simultaneously. However, in this study, P/L ratios were not correlated with selenium levels in the hepatopancreas. This contrasts with published data regarding hematological changes, condition factors, and relative hepatopancreas weight for the same redear sunfish collected for this study. Relative ratios of pancreatic cells to liver cells determined in this study, therefore, were less accurate in pinpointing biological changes due to selenium than were the other parameters previously published using these same fish.

84-001560 Sreeramulu Chetty, C.; R. Chandramohan Naidu; Y. Srinivasa Reddy; P. Aruna and K. S. Swami. TOLERANCE LIMITS AND DETOXIFICATION MECHANISMS IN THE FISH *TILAPIA MOSSAMBICA* SUBJECTED TO AMMONIA TOXICITY. *Indian J. Fish.* 27(1-2):177-182. 1980. SFA 29(2)
[Dep. Zool., S.V. Univ., Tirupati 517502, India] The effect of induced ammonia toxicity on selected enzyme systems of carbohydrate and nitrogen metabolism of freshwater fish, *Tilapia mossambica* was studied. An increase in lactate dehydrogenase (LDH) and decrease in succinate (SDH) and malate dehydrogenase activity levels were noticed in all the tissues studied. The activity levels of asparate aminotransferase (AAT) decreased in all the tissues, while that of alanine aminotransferase (AIAT) had shown an increase. An elevation in the levels of arginase activity and urea was found in the gill and liver tissues. The metabolic significance of these results is discussed.

84-001561 Stevens, D. G. and G. A. Chapman. TOXICITY OF TRIVALENT CHROMIUM TO EARLY LIFE STAGES OF STEELHEAD TROUT. *Environ. Toxicol. Chem.* 3(1):125-133. 1984. SFA 29(2)
[U.S. EPA, Corvallis Environ. Res. Lab., Corvallis, OR 97333] Acute and early life stage toxicity tests were conducted with trivalent chromium and steelhead trout (*Salmo gairdneri*). A 96-h LC_{50} of 4,400 µg/L chromium was obtained with two-month-old juvenile fish. Early life stage exposure from newly fertilized eggs to 30-d post-swimup produced complete mortality at 495 µg/L, and significantly reduced survival to hatch and to the end of the test at 157 and 89 µg/L, respectively. An early life stage test started with eyed eggs produced similar results, with hatching survival significantly reduced at 271 µg/L. An acute test conducted with

TOXICOLOGY; BIOASSAYS (CONTINUED)

84-001561 CONTINUED fish surviving the early life stage test showed that no acclimation resulted from previous chromium exposure.

84-001562 Sultan, S. and S. M. Khan. HISTOPHATHOLOGICAL LESIONS INDUCED BY COPPER SULPHATE IN HEPATOPANCREAS OF *MOLLIENESIA* SP. *Indian J. Fish.* 28(1-2):276-277. 1981. SFA 29(2)
[Dep. Zool., Aligarh Muslim Univ., Aligarh-202001, India]

84-001563 Sumari, O.; H. Virtanen and A. Soivio. FORMALIINI-, SUOLA-, MALAKIITTIVIHREÄ- JA KALIUMPERMANGANAATTIHOIDON VAIKUTUKSESTA TAIMENEN (*SALMO TRUTTA* L.) KASVUUN JA KUNTOON. [THE EFFECTS OF TREATMENT WITH FORMALIN, SALT, MALACHITE GREEN AND POTASSIUM PERMANGANATE ON TROUT (*SALMO TRUTTA* L.) GROWTH AND CONDITION.] *Suom. Kalatalous* No. 49:1-8. 1983. In Finnish with English summ. SFA 29(2)
[Laukaan Keskuskalanviljelylaitos, 41360 Valkola, Finland]

84-001564 Thurston, R. V.; R. C. Russo; R. J. Luedtke; C. E. Smith; E. L. Meyn; C. Chakoumakos; K. C. Wang and C. J. D. Brown. CHRONIC TOXICITY OF AMMONIA TO RAINBOW TROUT. *Trans. Am. Fish. Soc.* 113(1):56-73. Jan. 1984. SFA 29(2)
[Fish. Bioassay Lab., Mont. State Univ., Bozeman 59717]

84-001565 Tuurala, H. RELATIONSHIPS BETWEEN SECONDARY LAMELLAR STRUCTURE AND DORSAL AORTIC OXYGEN TENSION IN *SALMO GAIRDNERI* WITH GILLS DAMAGED BY ZINC. *Ann. Zool. Fenn.* 20(3):235-238. 1983. SFA 29(2)
[Dep. Zool., Div. Physiol., Univ. Helsinki, Arkadiankatu 7, SF-00100 Helsinki 10, Finland] Rainbow trout (*Salmo gairdneri*, Richardson) were exposed in fresh water to zinc (1 mg/l) for 17-20 hours. The O_2-tension in dorsal aortic blood (pa_{O_2}) and external water PI_{O_2}) was measured and the secondary lamella of the gills were analysed morphometrically. Zinc exposure increased the PI_{O_2} - PI_{O_2} difference significantly. The PI_{O_2} - Pa_{O_2} difference was positively correlated with the increase in fractional volume of blood channels to which the diffusion distance from water was over 15 µm. The results are discussed in the light of the hypothesis that gill O_2-transfer is dependent on the intralamellar shunting of blood.

84-001566 Winkler, D. L.; K. L. Duncan; J. E. Hose and H. W. Puffer. EFFECTS OF BENZO(A)PYRENE ON THE EARLY DEVELOPMENT OF CALIFORNIA GRUNION, *LEURESTHES TENUIS* (PISCES, ATHERINIDAE). *NOAA Fish. Bull.* 81(3):473-481. July 1983. SFA 29(2)
[Environ. Manage. Div., Port of Los Angeles, 425 A. Palos Verdes St., San Pedro, CA 90733] Benzo(a)pyrene (BaP), which is carcinogenic and mutagenic in mammals, exists worldwide in the marine environment. Sources of this polycyclic aromatic hydrocarbon include oil spills, industrial effluents, and atmospheric fallout. This study is the first to examine the effects of BaP on the embryonic development of a teleost, the California grunion. Gametes were stripped from spawning adults, and eggs were artificially fertilized. The fertilized eggs were then incubated for up to 14 days with initial concentrations of BaP ranging from 0 to 869 ppb. Steady-state tissue levels of BaP ranged 0.46 to 19.92 ppm, which represented bioaccumulation factors of 146-437 times the steady-state BaP concentrations

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84-001566 CONTINUED in seawater. When compared with controls, embryos exposed to initial BaP levels of 24 ppb or greater showed decreased hatchings, reduced notochord lengths, and increased morphological abnormalities. These results suggest that exposure of grunion embryos to BaP in contaminated areas may lead to their decreased survival.

FISH TOXICANTS

84-001567 California Department of Fish and Game. AN ASSESSMENT OF THE USE OF CHEMICAL FISH TOXICANTS IN CALIFORNIA. *Calif. Dep. Fish Game Inland Fish. Admin. Rep.* No. 83-2.4. 21p. Oct. 1983. SFA 29(2)
[Sacramento, CA]

RESEARCH AND MANAGEMENT-GENERAL

84-001568 Blumm, M. C. IMPLEMENTING THE PARITY PROMISE: AN EVALUATION OF THE COLUMBIA BASIN FISH AND WILDLIFE PROGRAM. *Environ. Law* 14(2):277-358. 1984. SFA 29(2)
[Northwestern Sch. Law, Lewis and Clark Coll., Portland, OR]

84-001569 Evans, D. O. and B. A. Campbell. AN ANNOTATED LISTING OF ORIGINAL FIELD DATA BOOKS AND DIARIES OF ONTARIO FISHERIES RESEARCH LABORATORY WORKERS (1921-1948). *Ontario Fish. Tech. Rep. Ser.* No. 11. 37p. 1984. SFA 29(2)
[Ontario Minist. Nat. Resour., Res. Sect., Fish. Br., Maple, ON L0J 1E0, Canada]

84-001570 Forshage, A. OVERVIEW OF TEXAS PARKS AND WILDLIFE DEPARTMENT'S FLORIDA LARGEMOUTH BASS PROGRAM. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:4-5. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Tyler 75707]

84-001571 Haas, R. and R. Pal. MOSQUITO LARVIVOROUS FISHES. *Bull. Entomol. Soc. Am.* 30(1):17-21. 1984. SFA 29(2)
[Dep. Biol., Calif. State Univ., Fresno] A review of the experiences of member states of the World Health Organization in the use of fishes as biological control agents, primarily of vectors of malaria, is given. Suggestions for studies needed and species of fish which offer promise as control agents are given.

84-001572 Hegen, H. E.; G. C. Matlock and A. W. Green. HANDLING AND TAGGING SURVIVAL OF HOOK-CAUGHT SPOTTED SEATROUT HELD IN CAGES. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:39-53. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Austin 78744] Spotted seatrout (*Cynoscion nebulosus*) (253-401 mm total length) captured by hook and line during June-September 1981 in seven Texas bays were held in wire cages for 7 days to estimate the survival of handled and tagged fish. Survival rates of handled (63 ± 10%) and tagged (46 ± 11%) fish were not significnatly different; individually and combined (54 ± 7%) survival rates were significantly

RESEARCH AND MANAGEMENT-GENERAL (CONTINUED)

84-001572 CONTINUED lower than the survival of control fish (80 ± 8%). Factors that might contribute to differences in survival rates among individual bay systems, such as salinity, water temperature and cage construction, are examined but not statistically analyzed.

84-001573 Ikonen, E.; U. Kokko; P. Tuunainen and H. Auvinen. NAHKIAISEN PYYNTI SUOMESSA VUONNA 1982. [RIVER LAMPREY FISHERIES IN FINLAND IN 1982.] *Suom. Kalatalous* No. 50. p. 90-98. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

84-001574 Kraai, J. E. OVERVIEW OF TEXAS PARKS AND WILDLIFE DEPARTMENT'S WALLEYE AND SMALLMOUTH BASS PROGRAMS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:8. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Canyon 79015]

84-001575 McCabe, R. OVERVIEW OF TEXAS PARKS AND WILDLIFE DEPARTMENT'S STRIPED BASS PROGRAM. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:6-7. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Waco 76705]

84-001576 Morrissy, N. POTENTIAL FISHERIES CAPABILITY OF THE ORD IN THE SHORT, MEDIUM AND LONG TERMS. *West. Aust. Dep. Fish. Wildl. Rep.* No. 59. 24p. 1983. SFA 29(2)
[West. Aust. Mar. Res. Lab., Dep. Fish. Wildl., P.O. Box 20, North Beach, W.A. 6020, Australia]

84-001577 North American Salmon Research Center. NASRC REPORT SERIES -1982. *NASRC Rep. Ser.* 1982. SFA 29(2)
[Huntsman Mar. Lab., Dep. Fish. Oceans, St. Andrews, NB]

84-001578 Toivonen, J. LOHI TUTKIMUKSEN, HYÖDYNTÄMISEN JA HOIDON KOHTEENA. [SALMON AS A SUBJECT FOR RESEARCH, EXPLOITATION AND MANAGEMENT.] *Suom. Kalatalous* No. 51. p. 29-39. 1983. In Finnish with English summ. SFA 29(2)
[Itü-Suom. Keskuskalanviljelylaitos, 8175 Enonkoski, Finland]

ADMINISTRATION AND PLANNING

84-001579 Nielsen, L. A. UNDERGRADUATE CURRICULA OF INLAND FISHERIES SCHOOLS. *Fisheries (Bull. Am. Fish. Soc.)* 9(2):5-7. Mar.-Apr. 1984. SFA 29(2)
[Dep. Fish. Wildl., VPI&SU, Blacksburg, VA] The undergraduate curricula of 17 fisheries programs were examined from lists of required courses. Only 15% of coursework was elective for the average curriculum. Humanities, general biology, and physical sciences made up over 70% of the average requirements. Total requirements for humanities and general biology were inversely porportional to total requirements for forestry and agriculture courses.

ADMINISTRATION AND PLANNING (CONTINUED)

84-001579 CONTINUED Total requirements for fisheries and aquatic biology courses were inversely proportional to total requirements for wildlife and fisheries-wildlife courses. Plans for curricular revision indicate that combined fisheries-wildlife programs will increase and that multiple-option fisheries programs may become more common.

84-001580 Schoning, R. W. SOME IMPACTS OF RESOURCE DATA USE IN FISHERIES MANAGEMENT. *N. Am. J. Fish. Manage.* 4(1):1-8. 1984. SFA 29(2)
[NMFS, Oreg. State Univ., Corvallis 97331]

REPORTS OF FISHERY STATIONS, STATES, ETC.

84-001581 Finnish Game and Fisheries Research Institute Fisheries Division. RIISTA- JA KALATALOUDEN TUTKIMUSLAITOKSEN KALANTUTKIMUSOSASTON TUTKIMUS-, PALVELU-, TIEDOTUS- JA JULKAISUTOIMINTA VUONNA 1982. [RESEARCH, SERVICE AND INFORMATION WORK, AND PUBLICATIONS OF THE FISHERIES DIVISION OF THE FINNISH GAME AND FISHERIES RESEARCH INSTITUTE IN 1982.] *Tiedonantoja* No. 22. p. 1-127. 1983. SFA 29(2)

84-001582 Roberts, R. J. INSTITUTE OF AQUACULTURE ANNUAL REPORT 1982-83. *Univ. Stirling Inst. Aquacult. Annu. Rep.* 1983. 41p. 1983. SFA 29(2)
[Inst. Aguacult., Univ. Stirling, U.K.]

84-001583 Tuunainen, P. KATSAUS SUOMEN KALATALOUSTUTKIMUSKEN HISTORIAN. [A REVIEW OF THE HISTORY OF FINNISH FISHERY RESEARCH.] *Suom. Kalatalous* No. 51. p. 3-16. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL193, 00131 Helsinki 13, Finland]

HABITAT ALTERATIONS

84-001584 Ash, A. N.; C. B. McDonald; E. S. Kane and C. A. Pories. NATUAL AND MODIFIED POCOSINS: LITERATURE SYNTHESIS AND MANAGEMENT OPTIONS. *U.S. Fish Wildl. Serv. FWS/OBS*-83/04. xvi + 156p. June 1983. SFA 29(2)
Available from Inf. Transer Spec., Natl. Coastal Ecosystems Team, USFWS, USFWS, NASA/Slidell Computer Complex, 1010 Gause Blvd., Slidell, LA 70458.

84-001585 Brayton, D. S. THE BEAVER AND THE STREAM. *J. Soil Water Conserv.* 39(2):108-109. Mar.-Apr. 1984. SFA 29(2)
[BLM, 2515 Warren Ave., Cheyenne, WY 82001]

84-001586 Claggett, S. W. and J. T. Windell. A CONCEPTUAL DESIGN PLAN FOR FISH HABITAT IMPROVEMENT ON A FOURTH ORDER COLDWATER TROUT STREAM. *J. Colo.-Wyo. Acad. Sci.* 16(1):5-6. Apr. 1984. Abstract only. SFA 29(2)
[Univ. Colo., Boulder] Stream order, gradient, pool-riffle ratio, meander factor, known distribution of high and low flows throughout the year, the principle of convergence and divergence of flow and physical habitat analysis data were used to prepare a fish habitat design plan for 1 km of coldwater trout stream. Spring and early summer peak snowmelt flows and approximately four months of winter low flow were major considerations in

HABITAT ALTERATIONS (CONTINUED)

84-001586 CONTINUED recommending improvements, however peak flows during a predicted 100-year flood was the single most important factor in final design. The goal of the plan was to create a naturally self-sustaining sport fishery by significant improvement of streambed and bank stability and increasing the holding water capacity during extreme low winter flows. The relationship between channel riffle width and number of pool-riffle sequence for gravel-rubble-boulder strewn streams was used to compute the number of pool-riffle sequences expected under natural condition. Random boulder placement, rock deflectors, rock dams, plunge pools, thalweg pools and riffle enhancement were recommended after laboratory derived data collection from an artificial stream.

84-001587 Everest, F. H. and D. R. Talhelm. EVALUATING PROJECTS FOR IMPROVING FISH AND WILDLIFE HABITAT ON NATIONAL FORESTS. *Pac. Northwest For. Range Exp. Stn. Gen. Tech. Rep.* 146. 12p. Nov. 1982. From Monthly Catalog of U.S. Government Publications p. 14. Feb. 1984. SFA 29(2)

84-001588 Meehan, W. R., (ed.). INFLUENCE OF FOREST AND RANGELAND MANAGEMENT ON ANADROMOUS FISH HABITAT IN WESTERN NORTH AMERICA. *Pac. Northwest For. Range Exp. Stn. Gen. Tech. Rep.* 149. v + 9p. Feb. 1983. From Monthly Catalog of U.S. Government Publications p. 14. Feb. 1984. SFA 29(2)

84-001589 Meehan, W. R., (ed.). INFLUENCE OF FOREST AND RANGELAND MANAGEMENT ON ANADROMOUS FISH HABITAT IN WESTERN NORTH AMERICA. *Pac. Northwest For. Range Exp. Stn. Gen. Tech. Rep.* 134. v + 6p. Jan. 1982. From Monthly Catalog of U.S. Government Publications p. 14. Feb. 1984. SFA 29(2)

84-001590 Neil, W.; B. Gallaway; P. Craig and W. Griffiths. THE EFFECTS OF THE ARCO CAUSEWAY AT PRUDHOE BAY ON FISH MIGRATION. *Proc. Alaska Sci. Conf.* 33:173. 1982. Title only. SFA 29(2)
[LGL Alaska Research Assoc., Inc., P.O. Box 80607, Fairbanks 99708]

84-001591 Rink, L. P. STREAM, RIPARIAN AND WETLAND ECOSYSTEMS FOLLOWING RECURRENT FLOODING. *J. Colo.-Wyo. Acad. Sci.* 16(1):5. Apr. 1984. Asbtract only. SFA 29(2)
[Univ. Colo., Boulder]

84-001592 Shomura, R. S. and W. M. Matsumoto. STRUCTURED FLOTSAM AS FISH AGGREGATING DEVICES. *NOAA Tech. Mem. NMFS SWFC* 22. 9p. 1982. From Monthly Catalog of U.S. Government Publications, Jan. 1984, p.60. SFA 29(2)
[NMFS, Southwest Fish. Cent., Honolulu, HI]

84-001593 Thomas, M. G. HUMAN DEMOGRAPHIC IMPACTS ON FISH AND WILDLIFE RESOURCES FROM ENERGY DEVELOPMENT IN RURAL WESTERN AREAS. *U.S. Fish Wildl. Serv.* FWS/OBS-83/27. xv + 357p. Sept. 1983. SFA 29(2)
[Midwest Research Inst., 425 Volker Blvd., Kansas City, MO 64110]

84-001594 Tsai, C. and M. L. Wiley. INSTREAM FLOW REQUIREMENTS FOR FISH AND FISHERIES IN MARYLAND. *Univ. Md. Water Resour. Res. Cent. Tech. Rep.* No. 69. v + 90p. June 1983. SFA 29(2)

HABITAT ALTERATIONS (CONTINUED)

84-001594 CONTINUED
[Chesapeake Biol. Lab., Cent. Environ. Estuarine Stud., Univ. Md., Solomons 20688]

84-001595 Windell, J. T. and S. Wint. THE CUMULATIVE IMPACT OF SMALL MODIFICATIONS TO FISHERIES HABITAT ON CLEAR CREEK, COLORADO. *J. Colo.-Wyo. Acad. Sci.* 16(1):5. Apr. 1984. Abstract only. SFA 29(2)
[Univ. Colo., Boulder] Stream habitat modification was estimated by field reconnaissance and map analysis. It was hypothesized that 1. large (stream orders 7-12) and medium (orders 4-6) sized streams that include the smallest percentage (3% and 15%, respectively) of lineal milage have been more heavily modified than small (orders 1-3) streams that form the largest (85%) total lineal milage, and 2. the mainstream of a drainage basin receives significantly greater modification than the tributaries. The mainstem of the Clear Creek drainage basin approximates 63.5 miles whereas the entire basin is a fifth order system and includes 879 miles. Major highway, channelization and urban areas impact 52.7, 18.6 and 22.7 miles of stream habitat, respectively. Modification by major highway, paved roads, channelization and urban areas on the tributaries to the mainstem of Clear Creek totaled 18.5 (2.5%), 71.2 (9.7%), 15.2 (2.1%), and 3.2 (0.4%) miles, respectively. Data indicate stream orders 1, 2, and 3 were least impacted whereas the stream orders 4 and 5 were most impacted and significantly degraded by the accumulation of numerous small habitat modifications.

HARVEST, CREEL CENSUS, ETC.

84-001596 Alagaraha, K. and M. Srinath. MARINE FISH LANDINGS IN INDIA--ESTIMATES AND PRECISION. *Indian J. Fish.* 27(1-2):155-160. 1980. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin, India]

84-001597 Daily, K. CHEWAUCAN RIVER AND DAIRY CREEK CATCHABLE TROUT FISHERIES. *Oreg. Dep. Fish Wildl. Fish Div. Inf. Rep.* No. 83-12. 10p. Aug. 1983. SFA 29(2)
A creel survey was conducted on the Chewaucan River and Dairy Creek in Lake County, Oregon, from 24 April through 6 September 1982, to estimate angler use, catch, and return of stocked catchable-size trout to the angler. On the Chewaucan River an estimated 3,205 anglers spent 8,406 hours to harvest 3,647 hatchery rainbow and 1,815 wild redband trout. The average catch rate was 0.6 fish per hour. The harvest of hatchery trout represented a 40.6% return to the angler. On Dairy Creek an estimated 1,018 anglers spent 2,676 hours to harvest 1,095 hatchery rainbow, 201 wild redband trout, and 90 brook trout. The average catch rate was 0.5 fish per hour. Return to the angler from the stocked trout was 14.6%. The 1982 survey is believed not to be representative of a normal fishery on either stream because unusually poor early-season conditions for fish stocking and angling reduced the harvest of stocked trout.

84-001598 FAO of the UN. 1982 YEARBOOK OF FISHERY STATISTICS. CATCHES AND LANDINGS. *FAO Fish. Ser.* 21. ix + 393p. 1984. SFA 29(2)
[Rome, Italy]

HARVEST, CREEL CENSUS, ETC. (CONTINUED)

84-001599 FAO of the UN. 1982 YEARBOOK OF FISHERY STATISTICS. FISHERY COMMODITIES. FAO Fish. Ser. 22. ix + 162p. 1984. SFA 29(2)
[Rome, Italy]

84-001600 Lehtonen, H. and K. Salojärvi. KOTITARVE- JA VIRKISTYSKALASTUS SUOMESSA VUONNA 1978. [SUBSISTENCE AND RECREATIONAL FISHERIES IN FINLAND IN 1978.] *Suom. Kalatalous* No. 50. p. 30-72. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

84-001601 Lehtonen, H. VIRKISTYS- JA KOTITARVEKALASTUS JA SEN MERKITYS SUOMESSA. [RECREATIONAL AND SUBSISTENCE FISHERY AND ITS IMPORTANCE IN FINLAND.] *Suom. Kalatalous* No. 51. p. 67-74. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

84-001602 MacKenzie, W. C. AN INTRODUCTION TO THE ECONOMICS OF FISHERIES MANAGEMENT. *FAO Fish. Tech. Pap.* No. 266. ix + 31p. 1983. SFA 29(2)
[950 Sadler Crescent, Ottawa, ON K2B 5H7, Canada]

84-001603 Muse, B. and K. O'Schelle. A SUGGESTED METHODOLOGY FOR ESTIMATING THE DISTRIBUTION OF OPERATING COSTS AND NET RETURNS IN ALASKA'S SALMON FISHERIES. *Proc. Alaska Sci. Conf.* 34:121. 1983. Abstract only. SFA 29(2)
[Alaska Commer. Fish. Entries Comm., Juneau]

84-001604 Seefried, M. THE COMMERCIAL FISHING INDUSTRY OF QUEENSLAND. *Queensl. Dep. Primary Ind. Inf. Serv.* QI83017. 53p. 1983. SFA 29(2)
[Queensland Parliamentary Library, Brisbane, Qld., Australia]

84-001605 Viitanen, M. KALASTUKSEN TALOUDELLINEN MERKITYS. [THE ECONOMIC SIGNIFICANCE OF FISHERIES.] *Suom. Kalatalous* No. 51. p. 91-96. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

MARKING AND TAGGING

84-001606 Carrier, J. C. NURSE SHARKS OF BIG PINE KEY: PRELIMINARY EVALUATION OF THE SUCCESS OF 3 TYPES OF EXTERNAL TAGS. *Fla. Sci.* 47(Suppl. 1):19-20. Mar. 1983. Abstract only. SFA 29(2)
[Dep. Biol., Albion Coll., Albion, MI 49224] Of 71 nurse sharks (*Ginglymostoma cirratum*) and 30 lemon sharks (*Negaprion brevirostris*) tagged from Big Pine Key (Florida Keys), 14 different nurse sharks have been recaptured once and 2 animals have been recaptured twice. Eight of the recoveries (from 7 different animals) were from a group of 19 animals tagged with only stainless steel barbed tags. Of 38 animals tagged with both nylon barbed spaghetti tags and modified Carlin disc tags, 8 recoveries (from 7 different animals) were recorded and of these recoveries, 3 had both tags in place, 1 carried only the nylon-barbed tag, and 4 had only the dic tag. 19

MARKING AND TAGGING (CONTINUED)

84-001606 CONTINUED animals have recently been tagged with all three tag types, but no recoveries have been reported to date. Photographic evaluation of recovered tags indicate greater success of steel tags and severe problems to growing animals from dic tags.

84-001607 Green, A. W.; G. C. Matlock and J. E. Weaver. A METHOD FOR DIRECTLY ESTIMATING THE TAG REPORTING RATE OF ANGLERS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:16. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Austin 78744]

84-001608 Grimes, C. B.; S. C. Turner and K. W. Able. A TECHNIQUE FOR TAGGING DEEPWATER FISH. *NOAA Fish. Bull.* 81(3):663-666. July 1983. SFA 29(2)
[Dep. Horticult. For., Rutgers Univ., New Brunswick, NJ 08903]

84-001609 Kaill, W. M.; C. B. Rawson; P. J. Probasco and T. Joyce. DEALING WITH MIXED STOCK PROBLEMS IN ALASKA'S SALMON FISHERIES: A PROGRESS REPORT ON THE USE OF HALF-LENGTH CODED WIRE TAGS ON PINK SALMON. *Proc. Alaska Sci. Conf.* 33:166-167. 1982. Abstract only. SFA 29(2)
[Alaska Dep. Fish Game, 333 Raspberry Rd., Anchorage 99502]

84-001610 MacRitchie, I. C. and E. R. Armstrong. AN INCENTIVE PROGRAM TO INCREASE ANGLER TAG RETURNS. *N. Am. J. Fish. Manage.* 4(1):129-130. 1984. SFA 29(2)
[Ontario Minist. Nat. Resour., P.O. Box 730, Cochrane, ON P0L 1C0, Canada]

84-001611 Stanley, C. A. SOME EFFECTS OF HANDLING TECHNIQUES ON RETURNS OF TAGGED AUSTRALIAN SALMON, *ARRIPIS TRUTTA* (BLOCH & SCHNEIDER). *Aust. J. Mar. Freshwater Res.* 34(6):845-855. 1983. SFA 29(2)
[Div. Fish Res., CSIRO Mar. Lab., P.O. Box 21, Cronulla, N.S.W. 2230, Australia] Return rates of different tag types used on Australian salmon were briefly reviewed. Internal tags, especially with attched plastic streamers, were clearly superior. The effects of time held before tagging and injury (including scale removal) on return rate were investigated. There was no evidence of any mortality caused by these factors and salmon appear to be a robust species, little affected by the stress caused by tagging operations. However, when fish were held under adverse conditions for long periods, or when wounds were pronounced, behavior changes were evident, which resulted in the nonparticipation of affected fish in movements from juvenile to adult areas. Such behavioural changes may be of importance in analysing tag data from other pelagic migratory species that could be more easily affected by stress.

STOCKING AND INTRODUCTIONS

84-001612 Carter, N. E. EXOTIC FISH INTRODUCTIONS IN TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:1-2. 1983. Abstract only. SFA 29(2)
[Tex. Parks Wildl. Dep., Austin 78744]

84-001613 Cuerrier, J. P. ADAPTATION OF ATLANTIC SALMON, *SALMO SALAR*, TO A RESTRICTED FRESHWATER ENVIRONMENT. *Can. Field-Nat.* 97(4):439-442. Oct.-Dec. 1983. In English with French summ. SFA 29(2)

STOCKING AND INTRODUCTIONS (CONTINUED)

84-001613 CONTINUED
[P.O. Box 7196, Ottawa, ON K1L 8E3, Canada] In an experimental stocking of a restricted freshwater environment, Papin Lake, Pontiac County, Quebec, Atlantic Salmon fingerling (25-35mm long) growth was remarkable because of the introduction and adaptation of smelts utilized by the landlocked salmon as forage food. After three summers, some salmon had reached 2.0-2.84 kg. In Papin Lake, salmon reached first sexual maturity after three summer growing seasons, age 2+. No natural propagation was successful due to the absence of an inflowing stream. The last catch of a landlocked salmon in Papin Lake was made at the end of June 1981. The specimen was 8 years old and had been stocked in 1973.

84-001614 Garrett, G. P. STATUS REPORT ON PEACOCK BASS (*CICHLA* SPP.) IN TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:20-28. 1983. SFA 29(2)
[Tex. Parks Wildl. Dep., Ingram 78025]

84-001615 Hubbs, C. SIGNIFICANCE OF NONNATIVE FISH INTRODUCTIONS IN TEXAS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:3. 1983. Abstract only. SFA 29(2)
[Dep. Zool., Univ. Tex., Austin 78712]

84-001616 Johnson, L. D. COMPARISON OF MUSKELLUNGE *(ESOX MASQUINONGY)* POPULATIONS IN A STOCKED LAKE AND UNSTOCKED LAKE IN WISCONSIN, WITH NOTES ON THE OCCURRENCE OF NORTHERN PIKE *(ESOX LUCIUS). Wis. Dep. Nat. Resour. Res. Rep.* 110. 17p. Nov. 1981. SFA 29(2)
[Bur. Res., Wis. Dep. Nat. Resour., Spooner] Populations of muskellunge (*Esox masquinongy*) in Sand Lake, which has not been stocked with muskellunge for over 26 years, were compared with populations in Lac Court Oreilles, which has been stocked annually since 1933 with the exception of 5 experimental nonstocking years, 1966-70. Muskellunge caught in both lakes during the 1972-78 spawning runs were similar in maximum size, but Lac Court Oreilles had proportionately more large (over 45 inches) and more old (over age XV) individuals. Sand Lake had two to three times the estimated number of muskellunge/acre, but the population density in both lakes was low (1 fish/5-20 acres) as compared to some other Wisconsin lakes. Stocking appeared necessary for maintenance of the muskellunge population at its present level in Lac Court Oreilles. Naturally reproduced fish did not increase in number during the 5-year nonstocking period; rather nonstocking produced a "hole" where reduced numbers of fish from these 5 year classes were recruited to the adult population. Absence of stocking was not the only factor producing weak year classes during the study. Low survival of the stocked 1958-60 year classes resulted in a similar "hole" in the population age structure. While it was obvious that stocking increased the numbers of adult muskellunge in Lac Court Oreilles samples, Sand Lake maintained a naturally reproducing population without stocking. The invasion and subsequent establishment of large populations of northern pike (*Esox lucius*) appeared to be related to the observed decline in the muskellunge population in Lac Court Oreilles. The more recent invasion of northern pike into Sand Lake, however, has not shown a decreased muskellunge population within the period of this study.

84-001617 Nester, R. T. and T. P. Poe. FIRST EVIDENCE OF SUCCESSFUL NATURAL REPRODUCTION OF PLANTED LAKE TROUT IN LAKE HURON. *N. Am. J. Fish. Manage.* 4(1):126-128. 1984. SFA 29(2)
[Great Lakes Fish. Lab., U.S. FWS, 1451 Green Rd., Ann Arbor, MI 48105]

84-001618 Wentworth, R. S. and G. W. LaBar. FIRST-YEAR SURVIVAL AND GROWTH OF STEELHEAD STOCKED AS FRY IN LEWIS CREEK, VERMONT. *N. Am. J. Fish. Manage.* 4(1):103-110. 1984. SFA 29(2)
[Me. Dep. Environ. Prot., Presque Isle 04769]

FISHING GEAR AND TECHNIQUES

84-001619 Arimoto, T. [HORIZONTAL DISTRIBUTION OF CATCH AMONG BRANCHES IN COASTAL SET-LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(12):1797-1802. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Dep. Fish. Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato, Tokyo 108, Japan]

84-001620 Arimoto, T. and T. Iwasaki. [VERTICAL DISTRIBUTION OF CATCH IN COASTAL SET-LINE.] *Bull. Jpn. Soc. Sci. Fish.* 49(10):1479-1486. Oct. 1983. In Japanese with English summ. SFA 29(2)
[Dep. Fish. Sci. Technol., Tokyo Univ. Fish., Konan 4, Minato, Tokyo 108, Japan]

84-001621 Armstrong, M. C. and J. H. Mundie. FLOATING FISH SHOCKER. *Prog. Fish-Cult.* 45(4):236-237. Oct. 1983. SFA 29(2)
[Pac. Biol. Stn., Nanaimo, BC V9R 5K6, Canada]

84-001622 Bronte, C. R. and D. W. Johnson. EVALUATION OF THE COMMERCIAL ENTANGLEMENT-GEAR FISHERY IN LAKE BARKLEY AND KENTUCKY LAKE, KENTUCKY. *N. Am. J. Fish. Manage.* 4(1):75-83. 1984. SFA 29(2)
[Dep. Fish. Manage, Red Cliff Band, Lake Superior Chippewas, Box 529, Bayfield, WI 54814]

84-001623 Cole, R. A. and J. R. MacMillan. SAMPLING LARVAL FISH IN THE LITTORAL ZONE OF WESTERN LAKE ERIE. *J. Great Lakes Res.* 10(1):15-27. 1984. SFA 29(2)
[Dep. Fish. Wildl. Sci., N. Mex. State Univ., Las Cruces 88003] Sampling techniques for larval fish were evaluated in the littoral zone (1- to 6-m deep) of western Lake Erie in 1975 and 1976. Catch rates were compared using slow-speed, 1-m-diameter plankton nets in daytime and nightime oblique and stratified tows above bottom and in daytime epibenthic tows with an aluminum sled. Sampling efficiency also was compared using nets of 363-571-, 760-, and 1,000-µm mesh towed from 1 to 5 min. The most abundant larvae captured were clupeids (*Alosa pseudoharengus* and *Dorosoma cepedianumm*, yellow perch (*Perca flavescens*), rainbow smelt (*Osmerus mordax*), and white bass (*Morone chrysops*). Larvae did not consistently occur in one stratum over another in water above bottom, but concentrated near bottom during the day. Oblique, nightime tows above bottom caught at least 20 times the larvae caught in daylight tows above bottom. Post-yolk-sac larvae were most efficiently captured in nighttime oblique or stratified tows, while yolk-sac larvae were most efficiently captured by epibenthic, daytime tows. The 363-µm-mesh net retained more yolk-sac larvae than nets of larger mesh sizes and was at least as effective as the larger nets at capturing post-yolk-sac larvae. Nets with 571-µm mesh towed for 1, 2, 3, 4, and 5 min had similar catch rates so mesh plugging was not a problem under conditions sampled. Filtering rates of 363- and 760-µm mesh were similar to the filtering rate of 571-µm mesh when towed for 3 min. Precision (number of larvae caught per minute) and number of species caught were similar in tows more than 1-min long up to 5 min.

84-001624 Dewey, M. R. and T. E. Moen. EVALUATION OF A FRAME TRAWL AND TUCKER TRAWL FOR SAMPLING YOUNG-OF-THE-YEAR FISH. *Proc. Ark. Acad. Sci.* 37:19-21. 1983. SFA 29(2)

FISHING GEAR AND TECHNIQUES (CONTINUED)

84-001624 CONTINUED
[Fla. Fish. Res. Stn., U.S. FWS, P.O. Box 1669, Homestead, FL 33090] Relative efficiencies of two trawls--a 1.88 m^2 frame trawl and a 2 m^2 Tucker trawl--were compared for sampling young-of-the-year (YOY) shad, *Dorosoma* sp., crappies, *Promoxis* sp., and sunfishes, *Lepomis* sp. Seven tests with six replicate hauls for each net in each test were analyzed by non-parametric techniques. Relative efficiency ratios, calculated from mean density estimates, were compared. The Tucker trawl was the more efficient for sampling YOY shad, its relative efficiency increasing as shad length increased. Results for the other two taxa were less consistent. The larger size range of YOY shad captured compared with the size ranges of fish of the other two taxa, seemingly increased the avoidance capabilities of the shad. The absence of a bridle and otter boards on the Tucker trawl and towing the net away from the effect of the propeller wash contributed to its efficiency.

84-001625 Doubleday, W. G.; D. Rivard and W. D. McKone. ESTIMATION OF PARTIAL RECRUITMENT AND YIELD PER RECRUIT FOR AN OTTER TRAWL FISHERY FOR DEEPWATER REDFISH. *N. Am. J. Fish. Manage.* 4(1):15-31. 1984. SFA 29(2)
[Resour. Res. Br., Dep. Fish. Oceans, 240 Sparks St., Ottawa, ON K1A 0E6, Canada]

84-001626 Ferro, R. S. T. and B. J. Ritchie. SOME AIDS TO THE DESIGN OF SUBERKRUB OTTERBOARDS. *Scott. Fish. Inf. Pam.* No. 9 11p. 1984. SFA 29(2)
[Mar. Lab., P.O. Box 101, Victoria Rd., Torry, Aberdeen AB9 8DB, Scotland]

84-001627 Huson, R. M.; D. Rivard; W. G. Doubleday and W. D. McKone. IMPACT OF VARYING MESH SIZE AND DEPTH OF FISHING ON THE FINANCIAL PERFORMANCE OF AN INTEGRATED HARVESTING/PROCESSING OPERATION FOR REDFISH IN THE NORTHWEST ATLANTIC. *N. Am. J. Fish. Manage.* 4(1):32-47. 1984. SFA 29(2)
[Fish. Econ. Marketing, Dep. Fish. Oceans, Ottawa, ON, Canada]

84-001628 Klust, G. FIBRE ROPES FOR FISHING GEAR. *FAO Fish. Man.* xvi + 200p. 1983. SFA 29(2)
[FAO of the UN, Rome, Italy]

84-001629 Lee, J. [FUNDAMENTAL STUDIES ON THE NET-SHAPE OF THE DRAG NET-I ON THE SECTION SHAPE OF THE SIMPLIFIED MODEL OF BAG NET IN TWO-POINT SUSPENSION.] *Bull. Fac. Fish. Hokkaido Univ.* 34(4):323-333. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Lab. Fish. Gear Eng., Fac. Fish., Hokkaido Univ., Japan]

84-001630 Lee, J. [MODEL EXPERIMENT ON MEDIUM-SIZED OFFSHORE TRAWL NET AROUND CHOSHI.] *Bull. Fac. Fish. Hokkaido Univ.* 34(4):334-344. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Lab. Fish. Gear Eng., Fac. Fish., Hokkaido Univ., Japan]

84-001631 Mann, R. H. K. and T. Penczak. THE EFFICIENCY OF A NEW ELECTROFISHING TECHNIQUE IN DETERMINING FISH NUMBERS IN A LARGE RIVER IN CENTRAL POLAND. *J. Fish Biol.* 24(2):173-185. Feb. 1984. SFA 29(2)
[Freshwater Biol. Assoc., River Lab., East Stoke, Wareham, Dorset BH20 6BB, England] A new method of determining fish numbers in a large river, which involved electrofishing from boats downstream to an AC electrical barrier,

FISHING GEAR AND TECHNIQUES (CONTINUED)

84-001631 CONTINUED produced capture efficiencies for different species ranging from 28 to 82% when successive pairs of catches were combined. Estimates of population density, biomass and production for the 18 species in a 2.538 ha segment of the Pilica River, Poland revealed a decline in total numbers of the fish in species diversity between 1963 and 1980. This is attributed to increased fishing pressure, and to a loss in habitat diversity following the loss of many water mills and associated dams. The total production estimate of $0.85 gm^{-2}$ $year^{-1}$ is low compared with the few published estimates for other large rivers. Roach, dace, chub, gudgeon and bream were the most numerous fish and they constituted 75% of the total population estimate, and 68% of the standing crop and annual production.

84-001632 O'Gorman, R. CATCHES OF LARVAL RAINBOW SMELT (*OSMERUS MORDAX*) AND ALEWIFE (*ALOSA PSEUDOHARENGUS*) IN PLANKTON NETS OF DIFFERENT MESH SIZES. *J. Great Lakes Res.* 10(1):73-77. 1984. SFA 29(2)

[U.S. FWS, Oswego Biol. Stn., 17 Lake St., Oswego, NY 13126] Four 0.5-m plankton nets (one each of 0.355-, 0.450-, 0.560-, and 0.750-mm mesh) were used to collect larvae of the alewife (*Alosa pseudoharengus*) and rainbow smelt (*Osmerus mordax*) in northwestern Lake Huron and the St. Marys River. The number of larvae collected varied inversely with mesh size and the average length of larvae varied directly with mesh size. Numbers of each species caught on 0.355- and 0.450-mm mesh nets were significantly greater ($P<0.01$) than the numbers caught in 0.560- and 0.750-mm mesh nets. Numbers of alewives caught were significantly greater ($P<0.01$) in the 0.355- than in the 0.450-mm mesh, but numbers of rainbow smelt caught in the two meshes were about equal. Between the two larger-mesh nets, numbers of each species caught did not differ significantly. Nets with mesh larger than 0.355 mm were less effective at catching recently hatched larvae, and this reduced effectiveness accounted wholly for the smaller numbers caught in the 0.450-mm mesh net. Smaller numbers were caught in the 0.560- and 0.750-mm mesh nets not only because they caught fewer recently hatched larvae but also because they failed to retain older, larger larvae. Information on the effect of mesh size and towing speed on catches of larvae is important for making accurate estimates of larval densities.

84-001633 Siler, J. R. DESCRIPTION OF A TRAWL HANDLING STRUCTURE FOR A BOW-FISHED TUCKER TRAWL. *Prog. Fish-Cult.* 45(4):217-220. Oct. 1983. SFA 29(2)

[Prod. Environ. Serv., Duke Power Co., Rt. 4, Box 531, Huntersville, NC 28078]

84-001634 Ulltang, Ø. A MODEL FOR INCORPORATING CHANGES IN DISTRIBUTION OF FISHING EFFORT IN ASSESSMENT OF THE EFFECTS OF CHANGES IN TRAWL MESH SIZE. *Fiskeridir. Skr. Ser. Havunders.* 17(11):431-448. 1983. SFA 29(2)

[Inst. Mar. Res., Bergen, Norway]

84-001635 Willis, D. W.; D. W. Gabelhouse, Jr. and T. D. Mosher. COMPARISON OF WHITE CRAPPIE CATCHES IN THREE TYPES OF TRAP NETS. *Kans. Fish Game Comm.* 15p. Mar. 1984. Available from Kans. Fish Game Comm., Box 54A, RR2, Pratt 67124. SFA 29(2)

[This project was designed to compare catches of white crappie (*Pomoxis annularis*) in three types of trap nets: a small trap (ST) with 0.9- x 1.2-m

FISHING GEAR AND TECHNIQUES (CONTINUED)

84-001635 CONTINUED frames and 10-mm (bar measure) mesh; a large trap (LT) with 1.2- x 1.5-m frames and 25-mm mesh; and a large experimental trap (ET) with 1.2- x 1.8-m frames and 13-mm mesh. No differences in catch rates of length frequencies of stock-length fish were found between LT and ET. Catch rates of stock-length fish were significantly lower and less reliable in ST than in LT or ET. Catch rates of young-of-the-year fish were significantly greater in ET than in ST, but reliabilities of catch rate were similar. Present standard sampling utilizes both LT for stock-length fish population analysis and ST for a young-of-the-year index. The ET could collect both parameters with a single gear and reliability of samples could, therefore, be increased without increasing sampling effort.

84-001636 Yamaguchi, Y.; T. Nonoda; H. Kobayashi; K. Izawa; T. Jinno; I. Ishikura; M. Uchida and M. Tonogai. [EFFECTIVENESS OF ARTIFICIAL BAIT FOR OBTAINING HIGHER HOOKING RATE ON BOTTOM SET LONG-LINE FISHING.] *Bull. Jpn. Soc. Sci. Fish.* 49(12):1819-1824. Dec. 1983. In Japanese with English summ. SFA 29(2)
[Fac. Fish., Mie Univ., Edobashi, Tsu 2-80, Japan]

FERTILIZATION OF SOIL AND WATER

84-001637 Nichols W. C., Jr. APPLICATION OF LIQUID FERTILIZER TO HATCHERY PONDS. *Prog. Fish-Cult.* 45(4):223-225. Oct. 1983. SFA 29(2)
[Ala. Dep. Conserv. Nat. Resour., Marion State Fish Hatchery, Marion 36756]

FISHWAYS, FISH PASSAGE THROUGH DAMS, ETC.

84-001638 MacCall, A. D.; K. R. Parker; R. Leithiser and B. Jessee. POWER PLANT IMPACT ASSESSMENT: A SIMPLE FISHERY PRODUCTION MODEL APPROACH. *NOAA Fish. Bull.* 81(3):613-619. July 1983. SFA 29(2)
[NMFS, P.O. Box 271, La Jolla, CA 92038]

84-001639 Pavlov, D. S.; A. S. Barekyan; M. A. Skorobogatov and L. G. Shtaf. HYDRAULIC CHARACTERISTICS OF THE CURRENT THAT PRODUCES ROUTES FOR FISH MOVEMENT. *Dokl. Biol. Sci. (Engl. Transl. Dokl. Acad. Nauk SSSR Ser. Biol.)* 270(1-6):230-233. Nov. 1983. SFA 29(2)
[A.H. Severtsov Inst. Evol. Morphol. Anim. Ecol., Acad. Sci. USSR, Moscow, USSR]

84-001640 U.S. Army Corps of Engineers. ANNUAL FISH PASSAGE REPORT. *U.S. Army Corps Eng. North Pac. Div.* 1981. From Monthly Catalog of U.S. Government Publications p. 77. Feb. 1984. SFA 29(2)

MATHEMATICS, STATISTICAL METHODS, AND MODELING

84-001641 Fagan, R. EXPLORING FISHERIES DATA. *Proc. Alaska Sci. Conf.* 34:129. 1983. Abstract only. SFA 29(2)
[Sch. Fish. Sci., Univ. Alaska, Juneau]

MATHEMATICS, STATISTICAL METHODS, AND MODELING (CONTINUED)

84-001642 Hilborn, R.; C. J. Walters; R. M. Peterman and M. J. Staley. MODELS AND FISHERIES: A CASE STUDY IN IMPLEMENTATION. *N. Am. J. Fish. Manage.* 4(1):9-14. 1984. SFA 29(2)
[Inst. Anim. Resour. Ecol., Univ. British Columbia, Vancouver, BC V6T 1W5, Canada]

84-001643 Laurec, A. and J. G. Shepherd. ON THE ANALYSIS OF CATCH AND EFFORT DATA. *J. Cons. Cons. Inst. Explor. Mer* 41(1):81-84. Oct. 1983. SFA 29(2)
[ISTPM, B.P. 1049, 44037 Nantes Cedex, France] The Hoydal-Jones (Anon., 1982b) modification of Saville's (1981) method for the use of fishing effort data is derived from first principles. Both are shown to depend, *inter alia*, on the assumption that each fleet takes a constant fraction of the total catch, which may be false. It is shown that both methods are closely related to the 'gamma-method' of analysis, and their relative virtues are discussed, together with a suggestion for a possibly perferably hybrid method.

84-001644 Livingston, P. A. POTENTIAL USE OF THE ANDERSEN-URSIN MULTISPECIES BEVERTON AND HOLT MODEL FOR MODELLING NORTH PACIFIC FISH INTERACTIONS. *NOAA Tech. Mem. NMFS F/NWC* 43. iii + 31p. Mar. 1983. From Monthly Catalog of U.S. Government Publications p. 47. Feb. 1984. SFA 29(2)

84-001645 Malkin, Y. M. EMPIRICAL ANALYSIS OF THE MAIN THEORETICAL METHODS OF ASSESSING FISH MORTALITY. *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):20-36. 1983. SFA 29(2)
[VNIRO, Moscow, USSR]

84-001646 Mangel, M. and C. W. Clark. UNCERTAINTY, SEARCH, AND INFORMATION IN FISHERIES. *J. Cons. Cons. Inst. Explor. Mer* 41(1):93-103. Oct. 1983. SFA 29(2)
[Dep. Math., Univ. Calif., Davis 95616] We consider the problem of modelling uncertainty in the location of schools of fish and the effect of search by fishing vessels in reducing the uncertainty. Our methods involve a preliminary period of searching and fishing, followed by a Bayesian update of information and a reallocation of vessels. The first search problem that we study is how to determine the optimal allocation of search effort over several historical fishing grounds, in which the current abundance of fish has a known prior probability distribution. In our second application, we consider the case of a single fishing ground and determint the optimal allocation of search effort over time. We assume that fishermen are profit maximizers (although this can be relaxed) and compare the value of competitive fishing strategies with cooperative ones in which search effort is optimized.

84-001647 Srinath, M. and K. Alagaraja. A METHOD OF ESTIMATION OF MORTALITY RATES FROM LENGTH SAMPLES. *Indian J. Fish.* 28(1-2):183-188. 1981. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin, India]

84-001648 Svirezhev, Y. M.; V. P. Krysanova and A. A. Voinov. MATHEMATICAL MODELLING OF A FISH POND ECOSYSTEM. *Ecol. Model.* 21(4):315-337. Mar. 1984. SFA 29(2)
[Computer Cent., USSR Acad. Sci., Moscow, USSR]

LAKE MANAGEMENT AND RESEARCH

84-001649 Christenson, L. M.; A. M. Forbes and J. J. Kempinger. IMPROVED ANGLING QUALITY FOLLOWING CHEMICAL TREATMENT OF NEBISH LAKE AND RE-INTRODUCTION OF SMALLMOUTH BASS AND YELLOW PERCH. *Wis. Dep. Nat. Resour. Res. Rep.* 115. 16p. Mar. 1982. SFA 29(2)

[Bur. Res., Wis. Dep. Nat. Resour., Madison] Angling quality, in terms of catch (number/acre), yield (lb/acre) and catch rate (number/100 angling hours), greatly improved following chemical treatment and restocking of Nebish Lake, Vilas County, in 1966. A 12-species fish population was eradicated and adults of only 2 species -- smallmouth bass (*Micropterus dolomieu*) and yellow perch (*Perca flavescens*) -- were re-introduced. Harvest statistics for a 12-year pretreatment period were compared to those of the 1st 4 years after treatment (transition period) and to those of the following 5 years (posttreatment period). During the posttreatment period, the catch, yield, and catch/100 hours increased 209%, 105%, and 59%, respectively, as compared to the pretreatment period. While the game fish yield increased only 38%, the catch of game fish increased 256%. From a species management perspective, improvement of angling quality for the smallmouth bass and yellow perch was phenomenal. The catch, yield, and catch rate of smallmouth bass rose from 2.6 to 15.3 fish/acre (488%), from 0.8 to 4.7 lb/acre (488%), and from 12.4 to 35.0 fish/100 hours (182%), respectively. Comparable percentage increases for the yellow perch were 263%, 244%, and 95%. Although chemical treatment and restocking has long been an important fish management practice in Wisconsin, this study is the 1st to document fishing quality, as defined above, before and after the reclamation process.

84-001650 Dirin, D. K. BIOLOGICAL CONSIDERATION RELATING TO MINIMUM COMMERCIAL SIZE FOR THE LAKE SALMON, *SALMO SALAR* MORPHA *SEBAGO* (SALMONIDAE). *J. Ichthyol. (Engl. Transl. Vopr. Ikhtiol.)* 23(3):37-52. 1983. SFA 29(2)

[Zool. Inst., USSR Acad. Sci., Leningrad, USSR]

84-001651 Durve, V. S. and V. Kakkar. CATCH ANALYSIS IN 1974 AND FISHING TRENDS IN THE JAISAMAND LAKE (RAJASTHAN). *Indian J. Fish.* 29(1-2):177-184. 1982. SFA 29(2)

[Dep. Limnol. Fish., Univ. Udaipur, India]

84-001652 FAO of the UN. REPORT OF THE FIFTH SESSION OF THE COMMITTEE FOR INLAND FISHERIES OF AFRICA. CAIRO, EGYPT, 15-20 January 1983. *FAO Fish. Rep.* No. 283. v + 23p. 1983. SFA 29(2)

[Rome, Italy]

84-001653 Hasselrot, B. and H. Hultberg. LIMING OF ACIDIFIED SWEDISH LAKES AND STREAMS AND ITS CONSEQUENCES FOR AQUATIC ECOSYSTEMS. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):4-9. Jan.-Feb. 1984. SFA 29(2)

84-001654 Nelson, R. W.; W. J. Logan and W. C. Weller. PLAYA WETLANDS AND WILDLIFE ON THE SOUTHERN GREAT PLAINS: A GUIDE TO HABITAT MANAGEMENT. *U.S. Fish Wildl. Serv.* FWS/OBS-83/29. ix + 99p. Sept. 1983. SFA 29(2)

[R. Wayne Nelson and Assoc., Inc., 275 Spruce Ct., Boulder, CO 80302]

84-001655 Nelson, R. W.; W. J. Logan and E. C. Weller. PLAYA WETLANDS AND WILDLIFE ON THE SOUTHERN GREAT PLAINS: A CHARACTERIZATION OF HABITAT. *U.S. Fish Wildl. Serv.* FWS/OBS-83/28. xvi + 163p. Sept. 1983. SFA 29(2)

[R. Wayne Nelson and Assoc., Inc., 275 Spruce Court, Boulder, CO 80302]

LAKE MANAGEMENT AND RESEARCH (CONTINUED)

84-001656 Okemwa, E. N. POTENTIAL FISHERY OF NILE PERCH *LATES NILOTICUS* LINNE (PISCES: CENTROPOMIDAE) IN NYANZA GULF OF LAKE VICTORIA, EAST AFRICA. *Hydrobiologia* 108(2):121-126. 16 Jan. 1984. SFA 29(2)
[Kenya Mar. Fish. Res. Inst., P.O. Box 81651, Mombasa, Kenya]

84-001657 Scheider, W. A. and T. G. Brydges. WHOLE-LAKE NEUTRALIZATION EXPERIMENTS IN ONTARIO: A REVIEW. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):17-18. Jan.-Feb. 1984. SFA 29(2)

84-001658 White, W. J.; W. D. Watt and C. D. Scott. AN EXPERIMENT ON THE FEASIBILITY OF REHABILITATING ACIDIFIED ATLANTIC SALMON HABITAT IN NOVA SCOTIA BY THE ADDITION OF LIME. *Fisheries (Bull. Am. Fish. Soc.)* 9(1):25-30. Jan.-Feb. 1984. SFA 29(2)

RIVER AND STREAM MANAGEMENT AND RESEARCH

84-001659 Armour, C. L.; K. P. Burnham and W. S. Platts. FIELD METHODS AND STATISTICAL ANALYSES FOR MONITORING SMALL SALMONID STREAMS. *U.S. Fish Wildl. Serv.* FWS/OBS-83/33. viii + 200p. Dec. 1983. SFA 29(2)
[U.S. FWS, Drake Creekside Bldg. One, 2627 Redwing Rd., Fort Collins, CO 80526]

84-001660 Fausch, K. D.; J. R. Karr and P. R. Yant. REGIONAL APPLICATION OF AN INDEX OF BIOTIC INTEGRITY BASED ON STREAM FISH COMMUNITIES. *Trans. Am. Fish. Soc.* 113(1):39-55. Jan. 1984. SFA 29(2)
[Dep. Fish. Wildl. Biol., Colo. State Univ., Fort Collins 80523]

84-001661 Skinner, M. M. and M. D. Stone. IDENTIFICATION OF INSTREAM HAZARDS TO TROUT HABITAT QUALITY IN WYOMING. *U.S. Fish Wildl. Serv.* FWS/OBS-83/13. ix + 69p. Mar. 1983. SFA 29(2)
[1316 Constitution, Fort Collins, CO 80521]

84-001662 Welcomme, R. L. RIVER BASINS. *FAO Fish. Tech. Pap.* 202. vi + 60p. 1983. SFA 29(2)
[FAO of the UN, Rome, Italy]

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH

84-001663 Doyle, K. M. and C. E. Boyd. THE TIMING OF INORGANIC FERTILIZATION OF SUNFISH PONDS. *Aquaculture* 37(2):169-177. 1 Mar. 1984. SFA 29(2)
[Dep. Fish. Allied Aquacult., Auburn Univ., AL] Fertilization with diammonium phosphate (20 kg/ha per application) was initiated at different dates in each of four treatments replicated three times in 0.04-ha ponds. Although there were some differences in averages of total and filtrable orthophosphate concentrations and phytoplankton abundance among treatments ($P<0.05$), sunfish production was not influenced by the timing of fertilization ($P>0.05$). Phytoplankton blooms did not develop in any of the treatments until late spring or early summer. The failure of phytoplankton to respond to fertilization in late winter and early spring was

FARM POND AND SMALL IMPOUNDMENT MANAGEMENT AND RESEARCH (CONTINUED)

84-001663 CONTINUED apparently related to low water temperature and competition by macrophytes. In larger, deeper ponds (>0.5 ha), inorganic fertilization will cause phytoplankton blooms in early spring even when water temperatures are low.

84-001664 Noble, R. L. and V. M. Henry. CORRECTIVE STOCKING OF FORAGE-DEFICIENT PONDS USING BLUEGILLS. *Annu. Proc. Tex. Chap. Am. Fish. Soc.* 5:54-65. 1983. SFA 29(2)
[Dep. Wildl. Fish. Sci., Tex. A & M Univ., College Station 77843] Eight ponds with established populations of largemouth bass (*Micropterus salmoides*) and forage other than bluegill (*Lepomis macrochirus*) were each stocked with 65-400 advanced bluegills/hectare. Seven of the eight populations were established on the first attempt. Bluegills showed no indication of overpopulating in any of the ponds. Bass populations which had been comprised of stunted individuals with low condition became characterized by larger individuals of higher condition within 1 year following bluegill introduction in some ponds. Responses in the three ponds larger than 1.5 hectares were more pronounced and occurred more quickly than in the two ponds less than 0.3 hectare. Corrective stocking with 75-100 bluegills/hectare at a minimum length of 75 mm is recommended.

84-001665 Wiley, M. J.; R. W. Gorden; S. W. Waite and T. Powless. THE RELATIONSHIP BETWEEN AQUATIC MACROPHYTES AND SPORT FISH PRODUCTION IN ILLINOIS PONDS: A SIMPLE MODEL. *N. Am. J. Fish. Manage.* 4(1):111-119. 1984. SFA 29(2)
[Ill. Nat. Hist. Serv., Nat. Resour. Bldg., 607 East Peabody Dr., Champaign 61820]

LARGE IMPOUNDMENT MANAGEMENT AND RESEARCH

84-001666 All-Union Research Institute of Marine Fisheries and Oceanography. [USE OF INLAND WATER BODIES OF THE AZOV AND CASPIAN SEA BASINS FOR FISHERY AND AQUACULTURE.] *All-Union Res. Inst. Mar. Fish. Oceanogr. (USSR)* 156p. 1983. In Russian with English summ. SFA 29(2)
A collection of papers.--RS

84-001667 Allanson, B. R. and P. B. N. Jackson. LIMNOLOGY AND FISHERIES POTENTIAL OF LAKE LE ROUX. *S. Afr. Natl. Sci. Prog. Rep.* No. 77. ix + 182p. Dec. 1983. Available from Coop. Sci. Prog., Counc. Sci. Ind. Res., P.O. Box 395, Pretoria 0001, South Africa. SFA 29(2)

84-001668 Bruce, W. J. POTENTIAL FISHERIES YIELD FROM SMALLWOOD RESERVOIR, WESTERN LABRADOR, WITH SPECIAL EMPHASIS ON LAKE WHITEFISH. *N. Am. J. Fish. Manage.* 4(1):48-66. 1984. SFA 29(2)
[Fish. Operations Br., Dep. Fish. Oceans, P.O. Box 5667, St. Johns NF A1C 5X1, Canada]

MARINE MANAGEMENT AND RESEARCH

84-001669 Anonymous. STATUS REPORTS ON WORLD TUNA AND BILLFISH STOCKS. *NOAA Tech. Mem. NMFS SWFC* 15:302p. July 1981. From Monthly Catalog of U.S. Government Publ. p. 48. Mar. 1984. SFA 29(2)

MARINE MANAGEMENT AND RESEARCH (CONTINUED)

84-001670 Courtois, R. and P. Lamoureux. L'EXPLOITATION DU HARENG AU QUÉBEC. ANALYSE DES DÉBARQUEMENTS DE 1959 À 1981. [THE EXPLOITATION OF HERRING IN QUEBEC. ANALYSIS OF LANDINGS FROM 1959 TO 1981.] *Que. Rech. Sci. Tech. Cah. Inf.* No. 106. v + 88p. Sept. 1983. In French with English summ. SFA 29(2)
[Serv. Aménage. Exploitation Faune, 337 rue Moreault, Rimouski, PQ G5L 1P4, Canada]

84-001671 FAO of the UN. INDIAN OCEAN FISHERY COMMISSION (IOFC) REPORT OF THE SECOND SESSION OF THE COMMITTEE FOR THE DEVELOPMENT AND MANAGEMENT OF FISHERIES IN THE SOUTHWEST INDIAN OCEAN. MAHE, SEYCHELLES, 13-15 DECEMBER 1982. *FAO Fish. Rep.* No. 285. vi + 50p. 1983. SFA 29(2)
[Rome, Italy]

84-001672 Parmanne, R. and V. Sjöblom. SILAKKAKANTOJEN TILA SUOMEN RANNIKOLLA 1973-82. [THE STATE OF BALTIC HERRING STOCKS OFF THE COAST OF FINLAND IN 1973-82.] *Suom. Kalatalous* No. 51:41-48. 1983. In Finnish with English summ. SFA 29(2)
[Kalantutkimusosasto, PL 193, 00131 Helsinki 13, Finland]

84-001673 Struik, G. J. COMMERCIAL FISHING IN NEW ZEALAND: AN INDUSTRY BENT ON EXTINCTION. *Ecologist* 13(6):213-220. 1983. SFA 29(2)

84-001674 Zafar Khan, M. A PROBABLE NURSERY GROUND OF SILVERPOMFRET *PAMPUS ARGENTEUS* (EUPHER) OFF NAWABUNDER (GUJARAT). *Indian J. Fish.* 29(1-2):257-261. 1982. SFA 29(2)
[Cent. Mar. Fish. Res. Inst., Cochin-18, India]

MISC. TECHNIQUES AND EQUIPMENT

84-001675 Thorne, R. E. APPLICATION OF HYDROACOUSTICS TO STUDIES OF FISH ABUNDANCE AND BEHAVIOR IN THE BEAUFORT SEA. *Proc. Alaska Sci. Conf.* 33:181. 1982. Abstract only. SFA 29(2)
[Fish. Res. Inst., WH-10, Univ. Wash., Seattle 98195]

REVIEWS, BIBLIOGRAPHIES, ETC.

84-001676 Olver, C. H. and N. V. Martin. A SELECTIVE BIBLIOGRAPHY OF THE LAKE TROUT, *SALVELINUS NAMAYCUSH* (WALBAUM), 1784-1982. *Ontario Fish. Tech. Rep. Ser.* No. 12. 109p. 1984. SFA 29(2)
[Ontario Minist. Nat. Resour., Algonquin Reg. Off., P.O. Box 9000, Huntsville, ON P0A 1K0, Canada]

WATERSHED MANAGEMENT

84-001677 FAO of the UN. GUIDELINES FOR WATERSHED MANAGEMENT. *FAO Conserv. Guide* 1. xiii + 293p. 1977. SFA 29(2)
[Rome, Italy]

WATERSHED MANAGEMENT (CONTINUED)

84-001678 French, C. O. and J. W. Parsons, (eds.). FLORIDA COASTAL ECOLOGICAL CHARACTERIZATION: A SOCIOECONOMIC STUDY OF THE NORTHWESTERN REGION. (2 VOLS.) *U.S. Fish Wildl. Serv.* FWS/OBS-83-15. 990p. Aug. 1983. Available from Inf. Transfer Spec., Natl. Coastal Ecosyst. Team, U.S. FWS, NASA-Slidell Computer Complex, 1010 Gause Blvd., Slidell, LA 70458. SFA 29(2)

84-001679 French, C. O. and J. W. Parsons, (eds.). FLORIDA COASTAL ECOLOGICAL CHARACTERIZATION: A SOCIOECONOMIC STUDY OF THE SOUTHWESTERN REGION. (2 Vols.) *U.S. Fish Wildl. Serv.* FWS/OBS-83/14. 1181p. Aug. 1983. Available from Inf. Transfer Spec., Natl. Coastal Ecosyst. Team, U.S. FWS, NASA-Slidell Computer Complex, 1010 Gause Blvd., Slidell, LA 70458. SFA 29(2)

A. Yaoming, Z.
84-001494
Abalos, T. U.
84-000808
Abe, H.
84-000916
Able, K. W.
84-001608
Adkins, T. C.
84-000826
Adron, J. W.
84-000838
Ahearn, G. A.
84-000950
Ahne, W.
84-001446
Aida, K.
84-000858
Akiyama, T.
84-000824
84-001016
Al Asgah, N. A.
84-000788
Al-Kadhomiy, N. K.
84-000857
Al-Tai, W. F.
84-000917
Alagaraja, K.
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